MILL SECTION of

Concrete

The Cement Mill Edition of Concrete is edited exclusively for those interested in the manufacture of portland cement. Its pages are devoted to discussions of plant design, management, operation, production efficiency, chemical research and control, quarry operation, progress and news of the industry.

The Cement Mill Edition also contains all the material published in the corresponding Regular Edition and so provides news of the uses and merchandising of the materials whose manufacture is discussed in the Mill Edition. The Regular Section furnishes mill operating officials and mill executives valuable points of contact with the users of the materials they produce.

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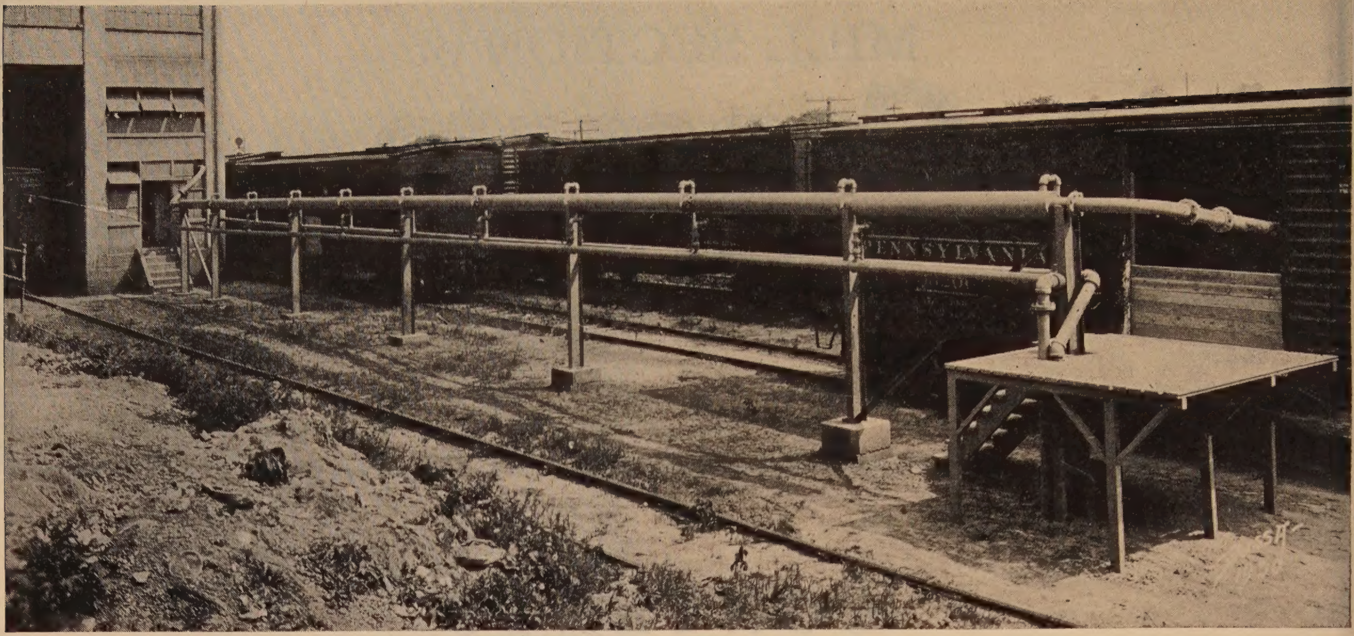

Water-cooled transport line loading bulk cement at the plant of the Valley Forge Cement Company. The pipe bend may be swung to load bulk cars on the siding shown in the foreground. This line is a branch of the silo-to-packhouse system and is arranged to avoid interference with the loading of cement in sacks.

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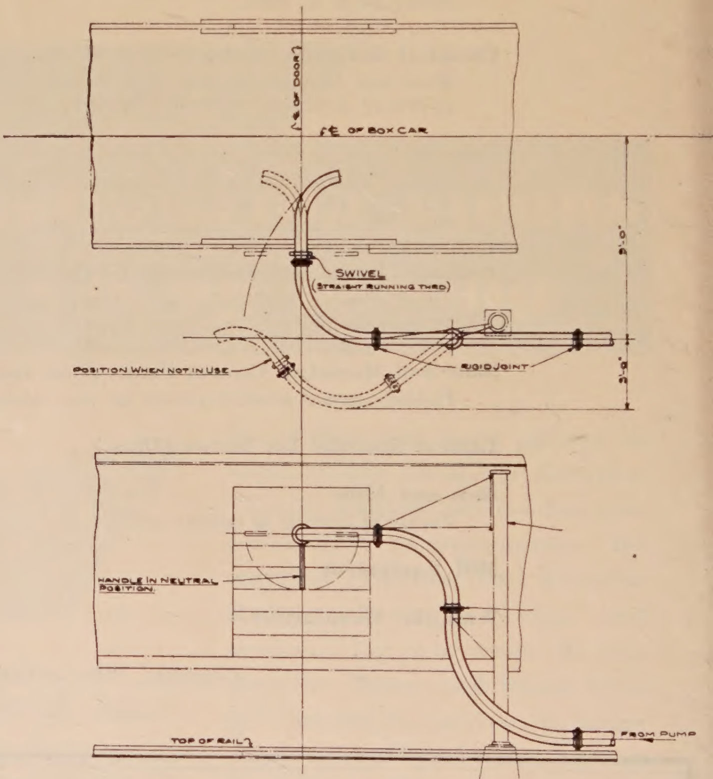

Another typical arrangement of a Fuller-Kinyon transport line for loading standard box cars in bulk. The final bend is arranged with a swivel connection and a handle to discharge cement toward either end of the car.

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MILL SECTION of

Concrete

Vol. 38 Chicago, May, 1931 No. 5

Finding Undeveloped Sources of Fuel for Cement Plants

Third Installment of Treatise on Use of Low Grade Fuels Describes Seven Additional Sources—Analyses, Methods of Treatment and Calorific Values

By E. T. ELLIS, F.J.I.
Ecclesall, Sheffield, England

In the first of these articles[1] attention was directed, as may be recollected, to the use and value of anthracite culm, anthracite slush or silt, batts from coal cleaning dumps, colliery slurry, colliery smudge, refuge from tipple picking tables, steam duff, tip breeze, and washery waste as fuel for cement factories, while in the second article[2] similar attention was devoted to the exploitation of bank small, colliery breeze, heap slack from soft coal, pit heap waste, tip waste, and unwashed duff for this purpose. In this third installment seven additional materials are discussed, which if properly treated are useful for heat raising in most cement works.—The Author.

FIRST of all, in considering these additional sources of fuel, let us direct the attention of cement companies to what are known as high grade washery settlings. These are obtainable at most collieries, and are often large in quantity, and, therefore, quite on the cheap side.

High Grade Washery Settlings

Cement concerns who buy this material should study the different analyses with care. In the high grade washery settlings a fixed carbon content of 52.5 per cent should be regarded as being the absolute minimum, though many so-called high grade samples will be offered with half this amount. The volatile matter content is also of some importance, and in really high grade samples 21 per cent should be aimed at, though here again parcels with a much lower volatile matter content will often be offered. The ash content should also be viewed critically, for it should not exceed 10.5 per cent. The moisture content is again of great importance. Unfortunately, this is invariably high, even in the best grades of washery settlings. Purchasers should decline all parcels which show more than 16 per cent of moisture, as the cost of drying them is, as a rule, too high to be remunerative. Bearing these constants in mind the calorific value of high grade washery settlings should be about 10,250 b.t.u.

The modus operandi varies considerably with the composition of the settlings. If, for instance, the moisture content is very much lower than the figure above stated, it is hardly necessary to put the settlings through presses in order to squeeze out some more. Air drying is, however, a matter of considerable importance, and this should be done without reducing the volatile matter content. That is, the settlings should be dehydrated but not carbonized. The settlings are as a rule in too finely a divided state for incombustible matter to be picked out on an endless band arrangement, but when the ash content is as high as 10.5 per cent the liberal addition of good grade coal or coke is an important feature, and more than 50 per cent should be added prior to grinding and direct firing. Coke breeze free from incombustible dust can also be added in liberal quantities prior to grinding, in order to increase the proportion of fixed carbon substantially, and at the same time to raise the calorific value well above 10,000 b.t.u.

Lignite and Washings

In some districts a mixed material consisting of lignite and washings is available. Its composition is variable, and its moisture content invariably high, while the calorific value is, as a rule, on the low side.

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[1] Cement Mill Section of CONCRETE, Feb., 1931, pp. 91-94.
[2] Cement Mill Section of CONCRETE, Apr., 1931, pp. 85-87.

The total amount of combustible matter present, when wet, should amount at least to 50 per cent, this including the fixed carbon content and the volatile matter. The high ash content is the worst feature about the material, this amounting in dry samples to 30 per cent, and in some instances rather more than this. However, lignite and washings can be picked over on an endless band arrangement, so that coarse pieces of mineral matter of an incombustible character can come out. Even then the ash content is very high, and a liberal quantity of really good grade coal or coke breeze free from mineral dust should be added, to improve the nature of this material as a fuel.

Another point which must never be disregarded is that the lignite and washings always contain a very big quantity of moisture. In the washings themselves, of course, moisture may be expected, but few realize how naturally wet lignite is, and the combination of the two, therefore, makes a very moist mixture. As a rule the quantity of useless water present amounts to 25 per cent, but a great deal of this can be got rid of by submitting the material to the action of presses, and after it has emerged from the presses further moisture can be got rid of by the usual air drying processes. The calorific value of wet lignite and washings rarely exceeds 3,550 b.t.u. per pound.

Low Grade Washery Settlings

Turn back now and have a look at the analysis above given of high grade washery settlings. Compare this with the data given below for another material which goes by the name of low grade washery settlings, and you will soon see why the best grades are to be preferred.

Low grade coal washing settlings are available with fixed carbon contents from 35 per cent downwards, but purchasers should specify that no sample shall be supplied them which does not show the full 35 per cent of carbon, as it is possible to obtain this even in the worst grades.

Strange as it may seem, the volatile matter content is no different from that of the high grade washery settlings above commented upon. It amounts to 21 per cent in most samples. Parcels can, of course, be picked up with a volatile matter content of nil, but no time should be wasted in hunting around for such samples, when the ordinary low grade washery settlings present so attractive a figure. The ash content, however, should be most carefully watched, as it is often fully 20 per cent, or almost double that of the high grade washery settlings. The moisture content may amount to fully 23 per cent, or nearly one-third more moisture than the high grade one.

In spite of these deficiencies the calorific value of low grade washery settlings is not very much below that of the high grade material, and 7,250 b.t.u. should be aimed at.

The modus operandi in this instance, when the material is very wet, may consist of treatment in powerful mechanical presses, so that some proportion of the moisture may be squeezed out in the form of an inky black liquor. Air drying is, however, the most important step, and this should be very thorough, as by its means the moisture content can at any rate be reduced by one-half, and in some instances it is possible to reduce it by as much as 75 per cent. The point to remember is that the low grade washery settlings must merely be dehydrated, not carbonized or coked, because if the temperature is too high much volatile matter may be driven off; and although the fixed carbon content will be increased the material may not be as easily fired.

Ash content can be reduced by treatment with various acids, but in most instances these methods are much too expensive and too troublesome to be recommended. The main thing to bear in mind is that the ash content must be kept down as low as possible.

Mixed Mud

Another low grade fuel which is more suitable than it sounds for use as a fuel in cement factories is that known as mixed mud. Some samples of it look like inky black clay, and when dug out of the tanks form comparatively solid lumps and dry on their outer surfaces with appreciable hardness.

Analysis shows, however, that many samples of mixed mud contain large quantities of combustible matter. The amount of this in a sample of wet mud before me is 60 per cent, including the fixed carbon and the volatile matter. The ash content of such a sample when it is quite dry is often extremely high, but not more than 23 per cent of incombustible matter should be accepted. As the material is an actual mud, much moisture will naturally be expected, but samples can be obtained with not more than 25 per cent of water if a genuine effort is made. This high quantity can, of course, be greatly reduced. Bearing the above constants in mind, the calorific value of wet samples of mixed mud is round about 4,800 b.t.u. per pound.

The modus operandi consists of pressing out as much moisture as possible, and then reducing it still further by suitable air drying. It may be pointed out en passant that many samples of mixed mud are highly suitable for coking or carbonization, and this step may be resorted to, provided that arrangements are made to collect the volatile matter which is given off, for independent use. Under such conditions it should be possible to obtain a mud coke with fully 80 per cent of fixed or elemental carbon; and this, when cold, can be broken up, mixed with coke breeze or good grade coal, and then finely ground for direct firing. Used in the ordinary way, air dried mixed mud should be well bulked up with other better grade fuels, as more than a fifth of its total bulk is unburnable.

Mixed Washings

Parcels of a low grade colliery fuel known as mixed washings are sometimes offered. Many have declined such offers, after noticing that the ash content, when dry, amounts to about 40 per cent. It is, however, a pity to turn down a fuel without fully considering its merits, and in many districts mixed washings deserve such consideration, on account of their large quantity, and the fact that they are relatively free from unwanted moisture, and can be pretty readily bulked up with other better grade fuels.

A total combustible matter content, when wet, of fully 58 per cent should be aimed at. If the amount of total carbon and volatile matter is substantially below this the buyer should go elsewhere. The ash content, when dry, is usually 38 per cent, but it is possible to purchase consignments with only 30 per cent of ash, and the reduction of eight or ten per cent makes a big difference. The moisture content is surprisingly low. Buyers should not take mixed washings with more than 5 per cent of moisture, though there are, of course, parcels on the market with 15 or 20 per cent. The calorific value of wet mixed washings is comparatively low, around 4,500 b.t.u. per pound. If, however, consignments with a smaller ash content than that above stated are obtained, the calorific value will be very much greater.

The modus operandi consists of careful air drying in order to get rid of some of the moisture, and then the mixed washings should be screened or sifted, in order to ascertain whether it is the fine material or the coarser stuff which contains the most incombustible matter.

Washery Finings

Another low grade fuel is that known as washery finings. An analysis of a suitable type for use in cement factories is before me, and in this the total quantity of fixed carbon content is 38.5 per cent, and this should be regarded as the absolute minimum. The volatile matter content is about 20 per cent, not much different from that of high grade washery settlings. It is the high ash content which worries us in dealing with washery finings, this amounting to 32 per cent, and in some instances being much more. In spite of expecting a large quantity of moisture to be present, this rarely exceeds 10 per cent. Samples which show the presence of 15 or 20 per cent of moisture should be declined. Bearing these constants in mind, it should be possible to obtain a calorific value of 7,500 b.t.u. from washery finings.

The modus operandi consists of reducing the moisture content by suitable air drying, or getting rid of it altogether by coking or carbonizing. Owing, however, to the fact that more than 30 per cent of incombustible matter is present, some trouble may be experienced in coking the finings. If this step is resorted to it is often wise to mix it with other higher grade fuels before introducing it into retorts. When successfully coked, however, a fuel rich in fixed carbon and of a very high calorific value results. It is easily broken up, and then fired in conjunction with the recognized fuels.

Washery Silt

The use of washery silt as a fuel for cement factories is well worth consideration. For some reasons it may be preferred to washery finings, while on other grounds they are preferable to it.

Washery silt as a fuel should show on analysis the presence of not less than 36.5 per cent of fixed carbon. Many parcels will be offered with a much smaller quantity, but these should be declined. The volatile matter content is also of some importance, and this is rather lower than that of washery finings, being 17 per cent in good grade samples. The ash content, however, is much lower than that of washery finings, which gives washery silt a big pull over the other low grade fuel. In the case of the silt no parcels should be purchased which show the presence of more than 21 per cent of incombustible matter. It must be remembered, however, that while the ash content is so much lower than that of washery finings, the moisture content is often very much higher, and fully 25 per cent of unwanted water may be expected. All offers of washery silt showing more than this should be declined, and every effort should be made to persuade colliery companies to reduce the moisture content very substantially before delivery, so that it will compare more favorably with that of washery finings and other low grade fuels. Bearing these constants in mind, the calorific value of washery silt is, as a rule, about 7,150 b.t.u.

The modus operandi does not vary much from that already described at some length above. When the moisture content is known to be fully 25 per cent it will pay to put the silt through mechanical presses in order to squeeze out an inky liquor, which, by the way, is of a highly polluting character if introduced into streams. When this has been done, air drying should be the next step, while if that does not reduce the moisture content satisfactorily, band drying through strongly heated ovens may have to be resorted to, but in this case the temperature requires to be very carefully regulated, as otherwise the volatile matter content will be greatly reduced, and the value of the fuel reduced instead of improved. Many samples of washery silt can be satisfactorily carbonized, and this is carried out without completely drying them in the first instance. The usual metallic retorts are employed, and the silt is rammed in, either alone or after being mixed with coal dust and other low grade fuels. Quenching is done cautiously, so as not to increase the amount of moisture unduly, consistent with putting a stop to atmospheric oxidation, and then the "silt coke," as we may call it, is ground up and mixed with any other good grade cement factory fuel, the combination of the two being fired.

Dewey Plant Shuts Down; Others Throughout Country Reopen

While other plants throughout the country were reopening, the Dewey plant at Dewey, Oklahoma, on April 3 announced that a temporary shutdown would be effective beginning the following day. The unsettled state highway cement situation prevailing in Oklahoma is largely responsible, according to Superintendent Don M. Tyler.

Among the plants to resume operation on or about April 1 were the Lone Star Cement Co., Indiana, plant at Limedale, where 225 are employed, the Kingsport, Tenn., plant of the Pennsylvania-Dixie Cement Corp., the Union Bridge, Maryland, plant of the Lehigh Portland Cement Co., the Alpha plant near Catskill, N. Y., and the Yosemite plant at Merced.

After having been closed since December 15th, the Medusa plant at Dixon, Ill., reopened April 6th on a limited schedule. The Cumberland plant at Cowan, Tenn., on April 1, resumed at 50 per cent of capacity after a two-month shutdown. The South Dakota state plant at Rapid City likewise reopened on March 13.

Kosmos Portland Incorporated in Indiana

The Kosmos Portland Cement Company, Inc., Louisville, has been incorporated under the laws of Indiana, to permit the warehousing of cement in a public terminal. The plant is located at Kosmosdale, Ky. The Indiana representative is C. B. Webster, Evansville, Ind.

Dealer Differential Is Abolished

Cement Companies Announce Marketing Plans that Permit Direct Selling to Large Users—Action Practically Unanimous

The dealer differential, long a subject of controversy among dealers, large cement users, and cement manufacturers, and often employed as a shield for marketing abuses, has finally been discontinued in the new sales plans announced by the Lehigh, the International, the Pennsylvania-Dixie, and a number of smaller companies.

Sell Direct to Large Users

In a general way these new plans conform to the sales policies previously announced by the Universal Atlas, the Medusa, and others, described in what was termed the third group in the April issue of the Cement Mill Section of CONCRETE, page 92. This means, in effect, that under the new sales plan the cement companies will sell direct (without service payments to dealers) to federal, state, county and municipal construction departments, to railroads and other public utilities, to contractors equipped to handle cement shipments without dealer service, to concrete products manufacturers, and to users in general who have facilities for handling cement. The dealer is to be protected only in cases where he performs actual dealer service, including the carrying of accounts. He will receive the usual and long-established cash discount of 10 cents per barrel for payment within 15 days.

Dealer Will Not Be Eliminated

Under the new marketing plan the dealer is not in any sense eliminated from his legitimate field, namely, his regular retail trade. The cement companies will quote a flat price to all dealers, but the dealers are free to fix their own retail prices. This arrangement is, in fact, in line with the desires of a large sectional group among the dealers themselves.

Abuse of the Dealer Differential

As was pointed out in the December, 1930, issue of the Cement Mill Section of CONCRETE, it was the abuse of the dealer differential system that led to its downfall. For many years cement companies followed the practice of quoting large users of cement 10 cents per barrel above the quotations to dealers. About 1925, or thereabouts, this plan was modified to the extent of quoting the same price to all buyers of cement at a given destination; but the principle of the dealer differential was maintained by allowing the dealer a special discount of 10 cents per barrel.

Competition and the desire to get the big orders soon led some dealers to use the 10-cent dealer discount as a trading medium, by passing a part of it on to the user. In due time many of the dealers retained only 2 or 3 cents of the discount and gave their larger customers the benefit of the remaining 7 or 8 cents. More recently some dealers passed on the entire discount, retaining no profit for themselves.

As a result of the practices just mentioned, contractors and other large users frequently were able to buy from the dealer at prices well below the prices quoted them by the manufacturer of the same brand of cement. This situation created the erroneous impression in many quarters that someone was reaping a big profit in the sale of cement, all of which resulted in the breeding of discontent among the large users, the dealers and the manufacturers alike.

Indiana Lets Highway Contracts for 1,770,000 Barrels

Letting of contracts to ten companies for 1,770,000 barrels of cement for the 1931 paving program was announced by the Indiana state highway commission late in March. The 1931 net price is $1.36, 29 cents lower than that paid in 1930. Twenty thousand barrels of the total will be high early strength cement.

Allotments were as follows: Lone Star Company, Limedale, 650,000 barrels of standard cement, also 20,000 barrels of high early strength; Universal Company, Buffington, 475,000 barrels; Lehigh Company, Mitchell, 325,000 barrels; Medusa Company, Sandusky, O., 75,000 barrels; Louisville Cement Company with plant at Speed, 100,000 barrels; Consolidated Cement Corporation, Cement City, Mich., 25,000 barrels; Southwestern Company, Dayton, O., 10,000 barrels; Kosmos Cement Company, Louisville, Ky., 25,000 barrels; Wabash Cement Company, Stroh, 25,000 barrels, and Marquette Cement Company, LaSalle, Ill., 40,000 barrels.

Rapid Growth of French Cement Industry

The production of cement in France during the last few years has rapidly developed as the following figures show:

Year	Tons
1925	5,769,500
1926	6,087,000
1927	6,806,700
1928	7,835,500
1929	8,192,000

During 1929 the production was divided among the different forms of cement as follows:

Artificial portland cement, 5,952,000 tons; slag cement, 375,000 tons; natural cement, 821,000 tons; lime slag cement, 887,000 tons; white cement, 69,000 tons; aluminous cement, 88,000 tons; a total of 8,192,000 tons.

Statistics for 1930 have not yet been issued.

Nebraska Plant Installs Air Separators and Dust Collectors

The Nebraska Cement Company began the installation of air separators in closed circuit with the finish grinding mills at its Superior, Nebraska, plant, early in April.

Installation of a dust collecting system in the packing and loading department had been completed previously.

Wolverine Cuts Shifts From Twelve to Eight Hours

Adoption of the 8-hour day became effective in the Coldwater, Michigan, plant of the Wolverine Portland Cement Company, beginning April 1. Twelve-hour shifts were previously in force.

The Quincy plant had not yet reopened at that time.

Chemical Reactions in the Setting of Cement

Test of Four Commercial Cements—Interpreting Results in Composition, Fineness and Strength—Sumary and Conclusions Presented

By LINCOLN T. WORK and FRANKLIN P. LASSETER

Results secured in investigations of several commercial cements are the subject of the third part of this original treatise.

This is the concluding installment, others having appeared in the March and April issues.—The Editors.

REACTIONS OF SOME COMMERCIAL CEMENTS

Two types of commercial cement clinker were tested—one a standard portland composition, the other a high-early-strength cement of somewhat higher lime content. Cements A, B, and C represent different finenesses of the normal portland cement, while cement D is the high-early-strength cement. The free lime content of these cements was low. As the comparison of cements A, B, and C is essentially one of fineness, sieve tests were supplemented by turbidity measurements which may be said to represent total surface. The method of making the turbidity tests and the manner of their representation has been described by Work[9]. The results are given in Table XIV.

TABLE XIV—TURBIDITY AND SIEVE DATA

Cement	Per Cent Through 200-Mesh	Turbidimeter Fineness
A	51.8	1.00
B	82.7	1.65
C	98.8	2.95

Values obtained in the tests on the commercial cements are given in Tables XV to XVIII, inclusive. The strengths of concretes made from these cements at one water-cement ratio are given in Table XIX with the corresponding lime and combined water values. These values were obtained from Prof. Duff A. Abrams, using the cements from the same batches. The data are graphically illustrated in the accompanying figures.

In general form the curves showing the combined water resembled those from tricalcium silicate. In other words, there was some moisture still present in the samples. There was again the same flattening of the curve at high water-cement ratio and before hydration was complete. The extent of this hydration varied with the composition, the high-early-strength cement showing marked reaction, and with fineness, the coarser cements showing less reaction than the finer ones.

The formation of lime was also similar to that shown for tricalcium silicate, save for the hollow in the curve at low water-cement ratios. It is thought that the aluminate reacted preferentially and that lime was not evolved until there was sufficient additional water for hydration and hydrolysis of the tricalcium silicate.

TABLE XV—REACTIONS OF CEMENT A

Percentages Based on Ignited Weight of Sample

No.	Per Cent H_2O Added	Per Cent H_2O Detn.	Per Cent H_2O 105 C.	Per Cent H_2O 105–850	Per Cent CaO	Per Cent H_2O as $Ca(OH)_2$	Per Cent H_2O Hydn.
24-hour data							
1	5.50	4.64	2.23	2.41	0.84	0.27	2.14
2	7.00	6.18	3.16	3.02	2.10	0.67	2.35
3	9.00	6.24	3.30	2.94	2.28	0.73	2.21
4	12.00	8.96	4.51	4.45	3.35	1.08	3.37
5	25.00	10.21	5.94	4.27	3.80	1.22	3.05
6	40.00	38.38	34.24	4.14	4.17	1.34	2.80
7	60.00	53.92	49.28	4.64	5.00	1.61	3.03
8	100.00	56.91	52.63	4.28	4.00	1.28	3.00
7-day data							
1	5.50	5.62	2.12	3.50	1.50	0.48	3.02
2	7.00	7.04	3.11	3.93	2.17	0.70	3.23
3	9.00	9.17	4.32	4.84	3.50	1.12	3.72
4	12.00	10.99	5.08	5.91	5.84	1.87	4.04
5	25.00	16.31	8.92	7.39	6.05	1.94	5.44
6	40.00	40.88	33.32	7.56	7.26	2.33	5.23
7	60.00	39.72	33.22	6.50	6.20	1.99	4.51
8	100.00	58.80	49.88	8.92	8.81	2.83	6.09
28-day data							
1	5.50	6.12	2.57	3.55	1.83	0.59	2.96
2	7.00	7.03	3.04	3.99	2.69	0.86	3.13
3	9.00	9.61	4.69	4.92	3.93	1.26	3.66
4	12.00	11.35	5.17	6.18	6.06	1.95	4.23
5	25.00	20.47	11.68	8.79	8.04	2.58	6.21
6	40.00	41.37	32.47	8.90	8.53	2.74	6.16
7	60.00	58.96	48.74	10.20	11.33	3.64	6.56
8	100.00	56.44	46.82	9.62	10.47	3.36	6.26
3-month data							
1	5.50	7.00	3.34	3.66	2.67	0.86	2.80
2	7.00	9.33	4.71	4.62	4.40	1.41	3.21
3	9.00	11.01	5.57	5.44	5.88	1.89	3.55
4	12.00	13.73	6.68	7.05	7.17	2.30	4.75
5	25.00	27.31	14.10	13.21	11.94	3.83	9.38
6	40.00	44.94	31.65	13.29	14.23	4.57	8.72
7	60.00	51.56	36.56	15.00	15.20	4.89	10.11
8	100.00	55.58	41.04	14.54	14.68	4.71	9.83
6-month data							
1	5.50	7.87	2.92	4.95	3.03	0.98	3.97
2	7.00	10.39	4.95	5.44	5.09	1.63	3.81
3	9.00	13.39	6.63	6.76	6.81	2.19	4.57
4	12.00	15.93	7.08	8.85	7.95	2.55	6.30
5	25.00	28.97	12.34	16.63	12.99	4.17	12.46
6	40.00	43.71	22.87	20.84	19.48	6.25	14.59
7	60.00	46.55	25.93	20.62	19.55	6.28	14.34
8	100.00	55.15	32.93	22.22	21.88	7.02	15.20

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[9] Lincoln T. Work, *Transactions* of A. S. M. E. *50*, 87 (Sept.-Dec. 1928).

TABLE XVI—REACTIONS OF CEMENT B

Percentages Based on Ignited Weight of Sample

No.	Per Cent H_2O Added	Per Cent H_2O Detn.	Per Cent H_2O 105 C.	Per Cent H_2O 105–850	Per Cent CaO	Per Cent H_2O as $Ca(OH)_2$	Per Cent H_2O Hydn.
24-hour data							
1	6.00	4.32	2.29	2.03	0.44	0.14	1.89
2	9.00	6.40	3.34	3.06	1.64	0.53	2.53
3	12.00	8.48	4.42	4.06	2.81	0.90	3.16
4	14.00	10.63	5.38	5.25	4.76	1.53	3.72
5	33.33	18.99	12.72	6.27	6.44	2.07	4.20
6	45.00	38.92	32.97	5.95	6.40	2.05	3.90
7	60.00	52.21	46.11	6.10	7.33	2.35	3.75
8	100.00	55.86	49.39	6.47	7.43	2.39	4.08
7-day data							
1	6.00	5.14	2.29	2.85	0.91	0.29	2.56
2	9.00	7.92	3.58	4.34	1.73	0.56	3.78
3	12.00	12.45	5.70	6.75	4.10	1.32	5.43
4	14.00	14.47	6.62	7.85	6.02	1.93	5.92
5	33.33	25.97	13.75	12.22	12.57	4.03	8.19
6	45.00	26.11	15.50	10.61	11.85	3.80	6.81
7	60.00	50.83	39.64	11.19	12.04	3.86	7.33
8	100.00	54.93	42.71	12.22	12.75	4.09	8.13
28-day data							
1	6.00	8.93	3.80	5.13	2.40	0.77	4.36
2	9.00	10.57	4.82	5.75	3.65	1.17	4.58
3	12.00	14.40	6.62	7.78	5.05	1.62	6.16
4	14.00	16.31	7.15	9.16	7.01	2.25	6.91
5	33.33	28.31	14.57	13.74	13.38	4.29	9.45
6	45.00	33.31	19.76	13.55	14.88	4.78	8.77
7	60.00	55.07	41.19	13.88	15.06	4.83	9.05
8	100.00	64.18	49.30	14.88	15.05	4.83	10.05
3-month data							
1	6.00	7.89	3.31	4.58	3.20	1.03	3.55
2	9.00	11.70	5.12	6.58	6.15	1.97	4.61
3	12.00	13.67	6.55	7.12	6.17	1.98	5.14
4	14.00	17.04	7.27	9.77	8.64	2.77	7.00
5	33.33	30.00	14.75	15.25	15.59	5.00	10.25
6	45.00	35.23	20.11	15.12	17.78	5.71	9.41
7	60.00	54.04	37.87	16.17	19.95	6.40	9.77
8	100.00	53.43	37.10	16.33	20.83	6.67	9.66
6-month data							
1	6.00	8.98	2.97	6.01	2.88	0.92	5.09
2	9.00	12.67	5.47	7.20	6.02	1.93	5.27
3	12.00	14.76	6.56	8.20	6.30	2.02	6.18
4	14.00	18.68	7.55	11.13	8.76	2.81	8.32
5	33.33	33.80	13.93	19.87	15.95	5.12	14.75
6	45.00	39.91	19.78	20.13	17.77	5.70	14.43
7	60.00	50.77	28.03	22.74	20.23	6.49	16.25
8	100.00	57.93	35.17	22.76	21.24	6.82	15.94

With the lower water-cement ratios there seems to be as much reaction with water in the coarse cement as in the finer material. This is probably due to the presence in the coarse sample of enough finely ground material to react with the small quantity of water added, while the larger particles function as aggregates. As the water-cement ratio is increased there is increased rate of reaction in the finely ground material for the first 28 days. This variation is due to the larger surface exposed to the action of water. Subsequent to that time the coarse cement reacted more rapidly than the fine.

FIG. 8

COMBINED WATER - CEMENT A

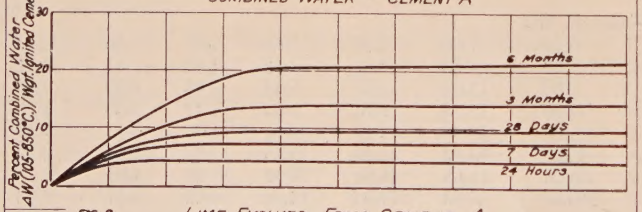
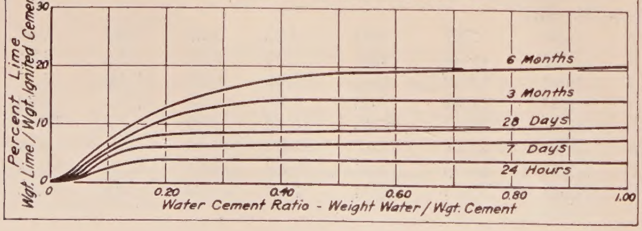


FIG. 9

LIME EVOLVED FROM CEMENT A



INTERPRETATION OF EXPERIMENTAL RESULTS

The experimental studies reveal several comparisons which serve to illustrate the manner in which hydration and hydrolysis are affected by the other characteristics of portland cement, and how the ultimate properties of the concrete are affected by the hydration and hydrolysis. One of these is the chemical composition of the portland cement, another is its fineness, the third is the strength of the ultimate concrete, and the fourth is the amount of water needed for subsequent curing.

The general bearing of these factors may best be shown after a brief description of the process of hydration. In the first place the cement is composed of large and small particles having a total surface defined by the extent of

TABLE XVII—REACTIONS OF CEMENT C

Percentages Based on Ignited Weight of Sample

No.	Per Cent H_2O Added	Per Cent H_2O Detn.	Per Cent H_2O 105 C.	Per Cent H_2O 105–850	Per Cent CaO	Per Cent H_2O as $Ca(OH)_2$	Per Cent H_2O Hydn.
24-hour data							
1	6.00	5.73	2.92	2.81	1.15	0.37	2.44
2	11.00	8.77	4.62	4.15	2.23	0.72	3.43
3	13.00	10.11	5.44	4.67	2.77	0.89	3.78
4	16.00	13.35	7.13	6.22	5.17	1.66	4.56
5	33.33	19.42	12.53	6.89	7.27	2.33	4.56
6	45.00	38.64	31.01	7.63	7.77	2.49	5.14
7	60.00	59.54	51.74	7.80	9.74	3.13	4.67
8	100.00	82.04	74.83	7.21	8.94	2.87	4.34
7-day data							
1	6.00	6.72	3.30	3.42	1.20	0.39	3.03
2	11.00	8.86	4.54	4.32	2.23	0.72	3.60
3	13.00	12.00	6.01	5.99	4.57	1.47	4.52
4	16.00	15.95	8.05	7.90	6.19	1.99	5.91
5	33.33	28.24	15.22	13.02	12.46	4.00	9.02
6	45.00	34.07	20.29	13.78	15.39	4.94	8.84
7	60.00	42.15	28.03	14.12	16.92	5.43	8.69
8	100.00	79.54	64.01	15.53	20.44	6.56	8.97
28-day data							
1	6.00	7.24	3.23	4.01	1.65	0.52	3.49
2	11.00	11.64	5.15	6.49	4.28	1.37	5.12
3	13.00	12.99	5.88	7.11	5.32	1.71	5.40
4	16.00	14.91	6.50	8.41	7.11	2.28	6.13
5	33.33	29.48	14.34	15.14	15.13	4.86	10.28
6	45.00	37.06	19.93	17.13	19.09	6.13	11.00
7	60.00	42.82	23.96	18.86	19.89	6.38	12.48
8	100.00	51.46	30.15	21.31	26.56	8.53	12.78
3-month data							
1	6.00	8.43	3.57	4.86	1.84	0.59	4.27
2	11.00	11.84	4.84	7.00	5.45	1.75	5.25
3	13.00	15.35	6.30	9.05	8.92	2.86	6.19
4	16.00	19.18	7.86	11.32	10.42	3.34	7.98
5	33.33	32.14	14.89	17.25	18.32	5.88	11.37
6	45.00	41.42	22.28	19.14	23.09	7.41	11.73
7	60.00	49.01	28.58	20.43	27.90	8.96	11.47
8	100.00	58.24	36.12	22.12	31.51	10.11	12.01
6-month data							
1	6.00	9.43	3.22	6.21	2.56	0.82	5.39
2	11.00	13.23	5.38	7.85	6.10	1.96	5.89
3	13.00	14.95	6.38	8.57	8.82	2.83	5.74
4	16.00	19.30	7.15	12.15	10.40	3.34	8.81
5	33.33	34.01	13.46	20.55	18.57	5.96	14.59
6	45.00	43.15	20.15	23.00	23.00	7.38	15.62
7	60.00	52.45	28.25	24.20	30.34	9.74	14.46
8	100.00	66.61	41.15	25.46	34.20	10.98	14.48

grinding. In the second place, it is an intimate mixture of aluminates, silicates, and other compounds, the character of which has been shown by petrographic studies. When the cement is mixed with water, the surfaces of the particles are wet, reaction takes place and precipitates are formed—the action being a surface phenomenon—and the products of hydration and hydrolysis are precipitated at the surfaces of the clinker particles. Finer particles are completely converted, whereas coarser particles are largely unconverted. Water which is to penetrate the coarse particles and react further with them must diffuse through the hydrated cement. Therefore, there may be expected a hydration gradient of greatly hydrolyzed material on the outside of a particle more or less in equilibrium with water, and a slightly reacted material in contact with the clinker core. After a time the unreacted interior of a particle would react at the expense of water at the surface. All these factors present variations in the hydration and hydrolysis of a cement. As they ultimately reach their application in the strength of concrete, strength may be considered the practical criterion by which to evaluate them.

TABLE XVIII—REACTIONS OF CEMENT D

Percentages Based on Ignited Weight of Sample

No.	Per Cent H_2O Added	Per Cent H_2O Detn.	Per Cent H_2O 105 C.	Per Cent H_2O 105–850	Per Cent CaO	Per Cent H_2O as $Ca(OH)_2$	Per Cent H_2O Hydn.
24-hour data							
1	6.00	5.58	2.61	2.97	2.13	0.68	2.29
2	11.00	7.58	3.88	3.70	3.67	1.18	2.52
3	13.00	9.66	4.96	4.70	4.63	1.49	3.21
4	16.00	11.89	5.71	6.18	6.00	1.93	4.25
5	33.33	22.29	11.60	10.69	10.80	3.47	7.22
6	45.00	26.55	15.19	11.36	11.92	3.83	7.53
7	60.00	28.69	16.41	12.28	13.38	4.29	7.99
8	100.00	67.18	54.83	12.35	14.26	4.58	7.77
7-day data							
1	6.00	6.79	3.01	3.78	2.26	0.73	3.05
2	11.00	10.65	4.78	5.87	4.24	1.36	4.51
3	13.00	12.86	5.21	7.65	7.46	2.39	5.26
4	16.00	15.94	6.40	9.54	9.43	3.03	6.51
5	33.33	28.77	13.62	15.15	16.25	5.22	9.93
6	45.00	42.77	23.92	18.85	22.74	7.30	11.55
7	60.00	45.58	26.05	19.53	23.60	7.58	11.95
8	100.00	46.56	25.39	21.17	24.64	7.91	13.26
28-day data							
1	6.00	9.13	3.59	5.54	3.00	0.96	4.58
2	11.00	11.94	4.77	7.17	4.71	1.51	5.66
3	13.00	15.24	6.09	9.15	7.56	2.43	6.72
4	16.00	16.73	6.51	10.22	9.97	3.20	7.02
5	33.33	27.81	11.77	16.04	16.55	5.31	10.73
6	45.00	44.71	22.42	22.29	23.65	7.59	14.70
7	60.00	50.36	27.16	23.20	26.39	8.47	14.73
8	100.00	50.56	25.80	24.76	29.19	9.37	15.39
3-month data							
1	6.00	8.18	3.10	5.08	6.32	2.03	3.05
2	11.00	12.15	4.40	7.75	7.74	2.48	5.27
3	13.00	16.08	5.72	10.36	11.41	3.66	6.70
4	16.00	20.07	7.36	12.71	13.13	4.21	8.50
5	33.33	33.37	13.22	20.15	23.33	7.49	12.66
6	45.00	49.05	24.86	24.19	34.24	10.99	13.20
7	60.00	68.12	44.12	24.00	31.86	10.23	13.77
8	100.00	68.23	43.34	24.89	32.38	10.38	14.51
6-month data							
1	6.00	9.79	2.92	6.87	5.52	1.77	5.10
2	11.00	12.88	4.39	8.49	7.41	2.39	6.10
3	13.00	17.76	5.99	11.77	9.93	3.19	8.58
4	16.00	20.65	6.56	14.09	12.03	3.86	10.23
5	33.33	34.80	12.05	22.75	22.00	7.06	15.69
6	45.00	52.28	24.40	27.88	32.30	10.37	17.51
7	60.00	55.35	27.64	27.71	31.50	10.11	17.60
8	100.00	55.74	27.64	28.10	34.00	10.91	17.19

TABLE XIX—EFFECT OF FINENESS OF A CEMENT ON STRENGTH, COMBINED WATER, AND LIME

W/c 0.55. Percentages Based on Ignited Weight of Sample

Per Cent Through 200-mesh Sieve	1 Da.	7 Da.	28 Da.	3 Mo.	6 Mo.
	Compressive Strength in lbs. per sq. in.				
51.8	300	1410	2180	2590	2750
82.7	690	2990	4310	5050	5200
98.8	850	4030	5150	5770	5700
	Water 105-850 C Per Cent by Weight				
51.8	4.5	7.5	9.6	14.2	20.8
82.7	6.0	11.0	13.8	15.5	21.3
98.8	7.6	13.8	18.0	20.0	23.6
	Lime—Per Cent by Weight				
51.8	4.2	7.0	9.4	14.5	19.3
82.7	6.9	12.3	14.8	18.6	19.3
98.8	8.2	16.3	20.5	25.5	27.6

Composition

The behavior of the pure compounds which are said to exist in portland cement has revealed their individual characteristics. The two portland cement clinkers which are represented comprised one of normal lime content, and one of higher than normal lime content. The latter, cement D, is supposed to be essentially an aluminate and trisilicate cement. As may be seen from the curves of hydration and hydrolysis of the normal portland cement, cement D hydrates and hydrolyzes more rapidly than the finest of the normal cements. When compared with tricalcium silicate, it shows markedly higher reactions during the 24-hour and 7-day periods. The larger amount of combined water during the earlier period might be attributable to the aluminate reactions, but it is also to be observed that the lime which is evolved is also greater in amount during those earlier periods. The difference not accounted for by selective hydration of aluminate might be accounted for in terms of the greater fineness of cement D.

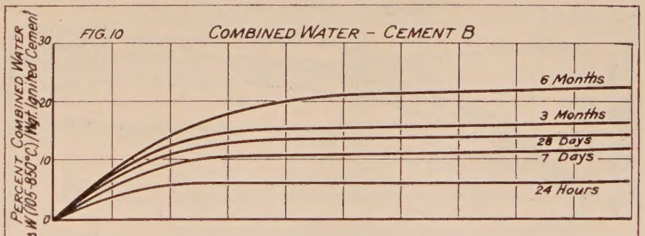


FIG. 10 COMBINED WATER – CEMENT B

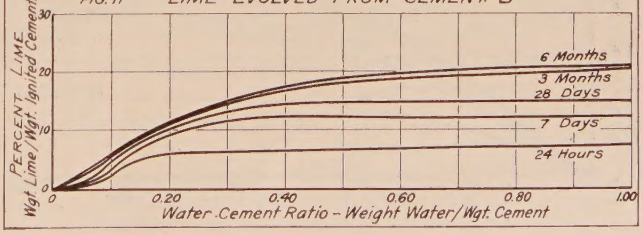
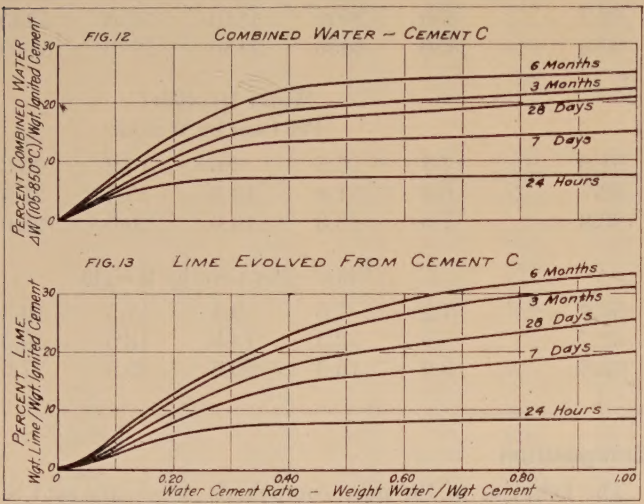
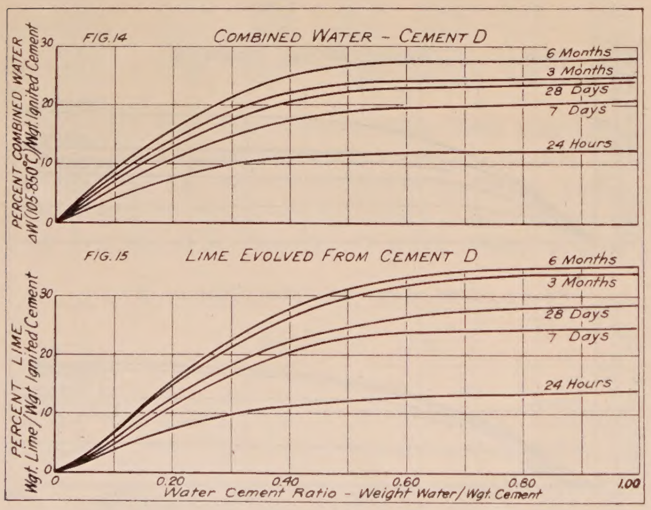


FIG. 11 LIME EVOLVED FROM CEMENT B

Fineness

With cements of three different finenesses produced from the same clinker, the comparison of the effect of fineness on hydration and hydrolysis may be made by a study of data and curves of cements A, B, and C. The accompanying figures illustrate the conditions which prevailed at a water-cement ratio of 0.55 and show that the amount of combined water at the end of six months is approximately the same for the three cements (Figure 16). However, the amount of lime generated on hydrolysis is somewhat greater with the fine cement than with the two coarser ones (Figure 17). It will be noticed that the relative increase in per cent, by weight, of combined water and hydrated lime formed during the periods between the 28-day and the 3-month tests, and the 3- and 6-month tests was greater in the coarse cement than in the finer samples. This is very clearly illustrated in Figure 19, where combined water is plotted against relative surface of cements A, B, and C; and in Figure 20, where per cent lime is plotted against relative surface for the same cements.





Strength

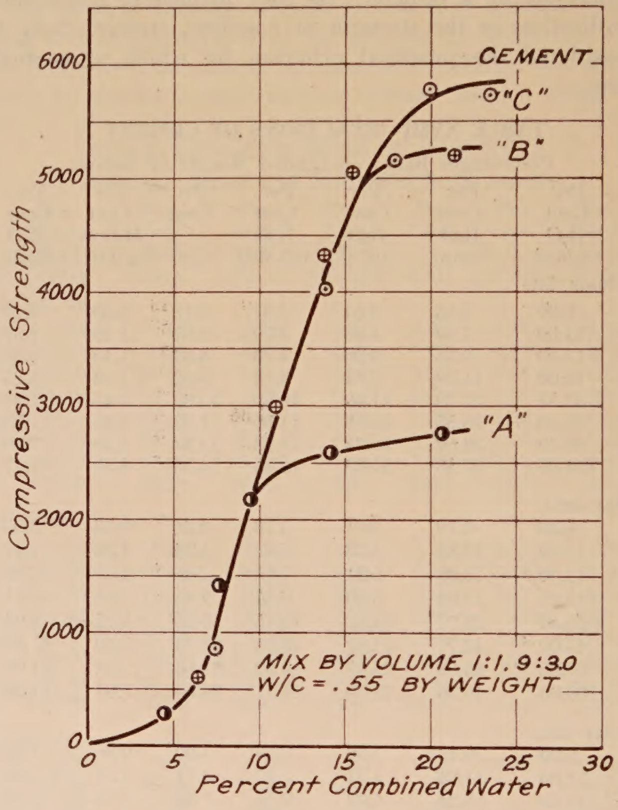
Examination of Table XIX and Figures 16 and 17 will serve to illustrate the relations between hydration and hydrolysis and the strength of a concrete made from the same cements at a definite water-cement ratio. It is to be noted especially that the compressive strength tends to reach a limit above which it increases but slowly even though the rate of hydration of the cement is still quite marked in amount. This indicates the probability that the reserve of clinker material is less the cause of increasing strength in the cement, and that the changes in strength are primarily due to changes in structure, as from forces of re-crystallization within the hydrated matter.

Water Required for Curing

Recently a change in practice in curing concrete has come into extensive use. Instead of the laborious method of covering with straw and bagging, with frequent supply of water, the fresh concrete is covered with an oily, more or less impermeable, film. In such a case the concrete depends upon the water placed in it for curing. The curve forms developed here throw some light on the effectiveness of such a method. A 7-day curing period and cement of the type of D may be assumed in order to represent an extreme case. The hydration which takes place in 7 days reaches a level value of about 20 per cent at water-cement ratios higher than 0.50. Without considering this in its greater refinements, it appears that concretes made of any workable consistency contain within themselves sufficient water for curing to a useful strength.

FIG. 16

COMBINED WATER AND STRENGTH



GENERAL SUMMARY AND CONCLUSIONS

1. The present oven test for moisture has been supplemented by a method of alcohol extraction at room temperature and by a method of distillation in hydrocarbons to evolve water rapidly and minimize moisture films. These tests have further justified oven drying at 105 deg.

C. as a reasonable point of separation into "free" and "combined" water.

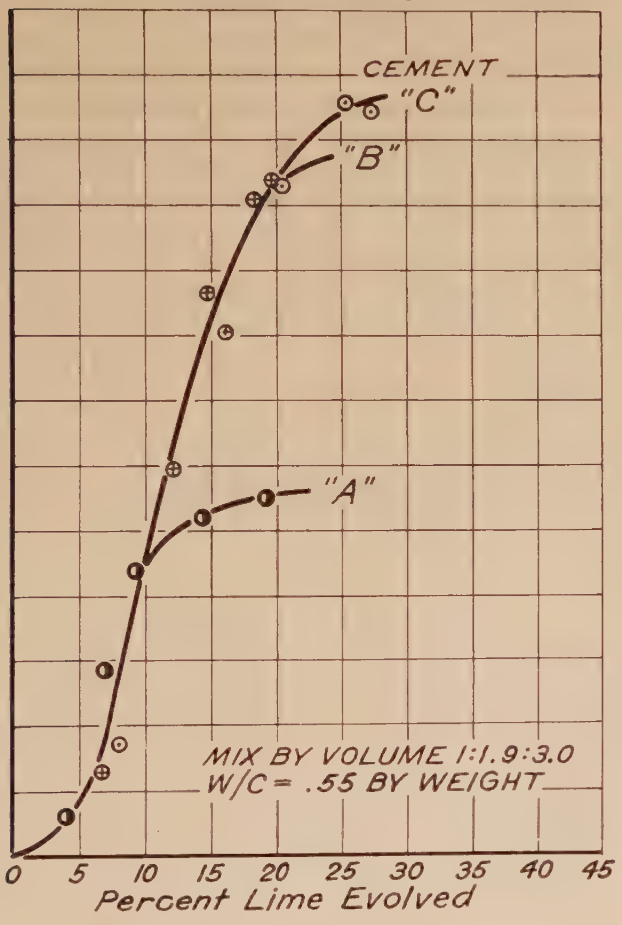
2. The ammonium acetate method of Bogue and Lerch has been made applicable to the measurement of calcium hydroxide in a set cement.

3. The curve forms for combined water versus water-cement ratio, and for hydrated lime versus water-cement ratio with respect to time have been established for the pure compounds and the cements.

(a) At low water-cement ratios all the added water combines with the tricalcium aluminate while at high water-cement ratios reaction becomes finally complete with formation of the hexahydrate in seven to twenty-eight days. While its high reactivity was known in a general way, these data give a quantitative measure of the rate and extent of hydration of one sample of this compound under normal curing conditions. The findings of Lerch and Bogue and of Thorvaldsen with respect to the formation of the hexahydrate and its decomposition at 600 deg. C. with production of lime have been confirmed. The hydrate has been partially dehydrated in vacua at 240-250 deg. C.

FIG. 17

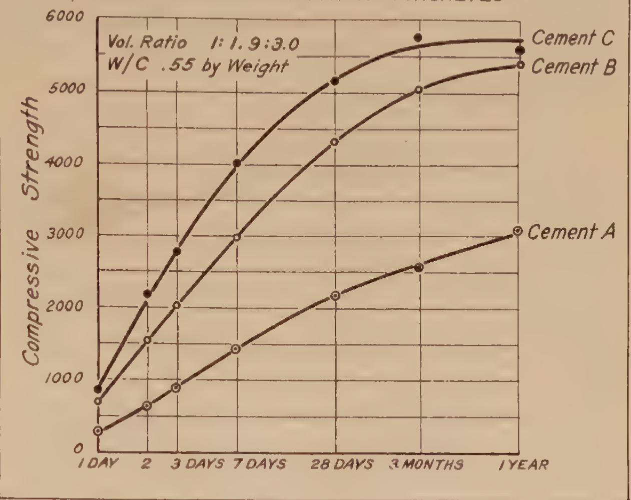
LIME EVOLVED AND STRENGTH



(b) In contrast to the aluminate, tricalcium silicate has shown appreciable quantities of free water at low water-cement ratios. The amount of combined water increases up to a water-cement ratio of about 0.3 by weight. After that point added water does not materially accelerate hydration. Further, it has been observed that during the first stages of hydration, roughly one molecule of water remains combined with the silicate for each molecule of lime which is liberated.

FIG. 18

COMPRESSIVE STRENGTH OF CONCRETES



(c) The low reactivity of beta dicalcium silicate during the first twenty-eight days has been shown by these measurements.

(d) The curves for the commercial cements resemble those for tricalcium silicate. They vary with fineness as shown by cements A, B, and C, and with composition of clinker as shown by cement D, which is high in combined lime. At low water-cement ratios there is a dip in the

FIG. 19

FINENESS AND COMBINED WATER

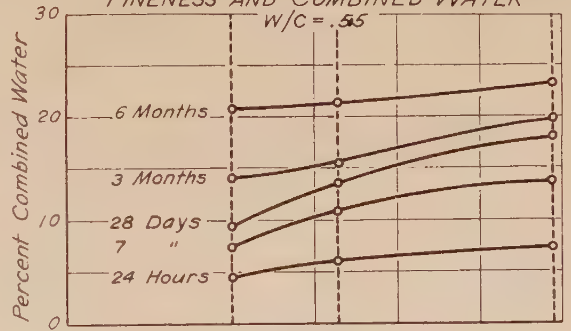
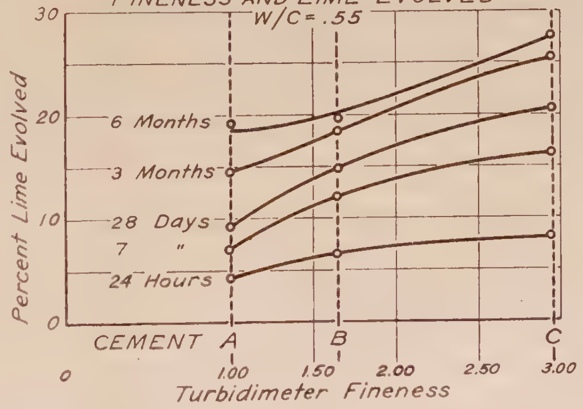


FIG. 20

FINENESS AND LIME EVOLVED



lime curves for which the best answer seems to be selective hydration of tricalcium aluminate.

4. The reactions as they are related to fineness, water-cement ratio, and concrete strength have been established for one clinker of normal cement composition. In addition to sieve data, a relative value of total surface has been measured by the turbidimeter. The curves of relative surface, i. e., turbidimeter fineness, show greater rate of reaction with the finer cement for twenty-eight days. After that the rate of reaction with the coarser cement increases but without corresponding increase in the strength of concrete made from this coarse cement. When these data on reaction and strength are compared, rate of reaction being ignored, it is observed that the cements of different fineness behave similarly when the total reaction is small.

Of the two clinkers tested, the one containing high combined lime showed greater reactivity during the first twenty-eight days. It was of the high-early-strength type.

In the commercial range of water-cement ratios all the cements tested contained sufficient water for adequate curing if its loss by evaporation could be prevented.

The results indicate that a large amount of reaction on ageing is unnecessary and undesirable. They appear to justify the present trend toward seeking initial reactivity in cement by higher combined lime in the clinker, and by greater than normal fineness.

Monterrey and Hidalgo Plants Involved in Mexican Merger

The two Mexican cement firms of Cementos Monterrey, S. A., and the Cementos Hidalgo of Monterrey and Hidalgo, State of Nuevo Leon, have merged to form the Cementos Mexicanos, S., A. The new company has a capital stock of $4,400,000. It will continue to operate the large cement manufacturing plants at Monterrey and Hidalgo involved in the merger.

Joseph Holmes Awards to Six Plants, Three Quarries

The Joseph A. Holmes Safety Association, affiliated with the United States Bureau of Mines, in its annual meeting held in Washington, D. C., on March 5, awarded certificates of honor to six cement plants and three cement plant quarries for exceptional safety achievements.

Those honored were the Cowell plant and quarry, Medusa plant, Alpha plants at Ironton, Ohio, Iola, Kansas, and Manheim, West Virginia, and the Pittsburgh plant of the Universal Atlas Cement Company.

The other two quarries named are the Pennsylvania-Dixie Nazareth Plant No. 4 quarry and that of the Louisville Cement Company at Speed, Indiana.

Marquette Orders Dust Collecting Equipment for Two Plants

Orders have been placed by the Marquette Cement Manufacturing Company with the Northern Blower Company, Cleveland, Ohio, for complete dust collecting equipment to be installed at the company's plants at St. Louis and at Memphis, Tennessee.

Similar equipment is also being installed at the Mexico City plant of the La Tolteca cia de Cemento Portland at Mexico City.

State Cement Plants Unprofitable

(Editorial in Oklahoma City Times, March 12, 1931)

WHILE there might be conditions and circumstances, such as a combine forcing exorbitant prices, that could justify a state in engaging in the manufacture of cement, current prices in this state do not warrant such a venture. The legislature will do well to consider the fact that other states have tried this plan and proved it unsatisfactory and unprofitable. The *Times* investigated state cement plants in several states a few years ago, and the revelations proved that state cement factories are dubious and losing investments.

The idea that the state can operate such a plant to an advantage, merely because it has convict labor, is untenable. Convict labor is not appreciably cheaper than free labor, when allowance is made for the difference in efficiency, the cost of maintaining guards, quarters, etc. The state need not figure it has better than an even break in the matter of labor, and there are other reasons why it cannot compete profitably with the privately owned plants.

With such highway construction as the state can finance, it cannot furnish a market for the steady output of a mill of the size needed for profitable production, and it would face many difficulties in offering convict-made cement in sales competition with the private companies in the open market. Even if it should undertake the expense of an organized sales force, that handicap would thwart its purpose.

Besides operating with inferior convict labor, the state plant would be under political management, and that management rarely makes for the greatest efficiency in operation. In view of the proportions of the investment the state would have to make to provide an output of profitable proportions, and the other proved handicaps such an enterprise must encounter, this state can ill afford an experiment that has proved costly where it has been tried. Oklahoma could work its convicts on the highways to advantage. Other states have proved the practicability of that plan, and it offers some relief from present prison congestion, as well as healthful employment for those thus engaged. That plan can be tried without a large initial investment, and with the assurance that it will work better than a state-owned cement plant.

~ EDITORIAL ~

Can An Armistice End This War?

PRICE wars are like other wars. The present price war in the cement industry is due to an accumulation of causes, none of which is pleasant to contemplate.

It is said that punishment is being meted out to companies that have been invading sales territory beyond their normal shipping radius, and that some of the price cutters of 1929 and 1930 are being given heavy doses of their own medicine.

Doubtless, also, there is a lurking desire in some quarters to reduce excess capacity by putting some of the weak and poorly equipped or poorly located plants out of business.

State and county highway departments have contributed to the trouble. Repeated rejections of all bids for cement for highway construction brought lower bids each time, until cement was being sold in large quantities below production costs.

The situation has grown intolerable. It is leading directly to the wreckage and back-wash of bitterness that accompany all price wars and other wars.

Regardless of the underlying causes, and regardless of who may have been the original culprits, a determined effort should be made to straighten out the difficulties. An opportunity to do this may be offered during the gathering of cement men in New York this month. The opportunity should not be lost, for this price war is the most destructive element in the cement industry.

Those South Dakota Cement Plant Profits

YEAR after year, beginning with 1925, the state auditor of South Dakota has reported a "profit" from the state-owned cement plant at Rapid City. In the 5½-year period from January 1, 1925, to June 30, 1930, this supposed profit was reported as amounting to $668,684.

Now it develops that William R. Coyle, member of Congress from Pennsylvania, has dug into the bottom of state cement plants and pulled out some interesting facts. Aided by several experienced accountants, he has found that South Dakota's state auditor forgot the interest on $2,275,000 in bonds issued to build the plant. Total interest paid prior to June 30, 1930, amounted to $747,250, more than enough to wipe out the $668,000 erroneously reported as the accumulated profit.

Liberties have also been taken with depreciation, which is less than that established by the United States Treasury Department as proper for the cement industry. The difference between the amount written off and the amount that should have been written off during the 5½-year period is estimated at $121,000.

The state auditor has likewise forgotten to take account of the tax that the state would receive if the plant were privately owned and operated. This amount, estimated at $212,000 in the 5½-year period, is properly chargeable against the cement plant.

Taking all these items into account, as they should be, the supposed accumulated profit of $668,000 becomes an accumulated loss of $411,000.

The records of three publicly-owned cement plants —in Michigan, in South Dakota, and in Los Angeles —are given in condensed form on another page in this issue. These three cases constitute most effective arguments against further construction of state-owned cement plants.

An informed public opinion will never sanction this form of waste of public funds. Consequently the cement industry must continue vigorously to drag the facts about state cement plants out by the heels where the public can see them.

Amending Our City Building Codes

EDITORIALS in the two issues preceding this one pointed out the vast market possibilities in the promotion of the concrete-encased steel frame type of building and the need for a designers' manual covering this structural type.

The lack of generally distributed formulas for the design of concrete-encased steel beams and girders has its counterpart in the lack of clauses in city building codes permitting both the concrete and the steel to be considered as taking stress. There is probably not one code that permits the designer to consider the strength of both materials in combination.

In consequence, city building codes will require amendment before the designer may consider the combined action of the two materials. This will be a long process, at times discouraging. Opposition will appear, especially from sources having selfish interests. Building inspection officials will be slow to accept a change in regulations of long standing.

The solution lies in well organized, co-ordinated effort by the cement industry and its allies. Half-way measures will not succeed. The market is there to be won, but only by aggressive and sustained action.

Horizontal Trend Shown in Output of Masonry Cements

Production and Shipment Show Little Change Over Five-Year Period—Eleven Plants Operating

Statistics of hydraulic cements, other than portland cement, which include masonry, natural, and puzzolan cements, as compiled by the United States Bureau of Mines, Department of Commerce, show a production of 2,209,465 barrels, in 1929. This represents a decrease of 0.04 of one per cent compared with 1928, and a continuation of the horizontal trend of the last four or five years. There were shipped from mills in 1929, 2,159,130 barrels of these cements, valued at $2,950,717, showing a decrease of nearly 2.5 per cent in quantity, and an increase of 1.4 per cent in gross value compared with 1928. Stocks at the mills increased and were more than 36 per cent higher at the end of 1929 than at the end of 1928.

These statistics represent the output of 11 plants located one each in Alabama, Illinois, Indiana, Kansas, Kentucky, Ohio, and Pennsylvania, and two each in Minnesota and New York. The figures for 1929 include the output of a new plant in New York which began operating toward the end of 1929, superseding an establishment that was active in 1928, but reported idle and out of business in 1929.

The output has been expressed in terms of 376-pound barrels to correspond with the statistics of portland cement.

MASONRY, NATURAL, AND PUZZOLAN CEMENTS PRODUCED, SHIPPED, AND IN STOCK IN THE UNITED STATES, 1925 TO 1929, INCLUSIVE

Year	Active Plants	Production Barrels	Shipments Barrels	Stock (Dec. 31) Barrels
1925	10	1,729,343	1,751,725	107,459
1926	11	2,104,891	2,031,851	181,928
1927	11	2,123,868	2,158,323	143,854
1928	11	2,210,404	2,213,645	137,357
1929	11	2,209,465	2,159,130	187,692

British Cement Manufacturers, Ltd., Has Record Year

Presiding at the twentieth annual meeting of the British Portland Cement Manufacturers, Ltd., which has just been held in London, P. Malcolm Stewart, chairman of the company, stated that one of the main factors affecting the trading conditions of the past year was the lower selling prices due to severe price-cutting having been experienced.

On the other hand, a much increased tonnage has been marketed under the firm's working agreement with Associated Portland Cement Manufacturers, Ltd., and this has been made possible by the substantial reductions in manufacturing costs resulting from the successful reconstruction of Johnson & Wouldham works, the largest owned by the company.

Satisfactory results have also been obtained from the new works at Hope, Derbyshire, which are excellently located for supplying the requirements of the Manchester and Sheffield districts. During the year the firm reaped the benefits which Mr. Stewart forecasted at the previous annual meeting, the deliveries of portland cement constituting a record in the history of the company. The profits earned, after making increased reserves for taxation, permit the provision of £255,000 for depreciation reserves, £46,968 for service of the debenture stock sinking funds, the payment of a dividend of 15 per cent on the ordinary stock for the year, and finally an additional £10,000 to the amount carried forward.

With regard to the prospects for the current year, Mr. Stewart declared that there were already clear indications of a revival of domestic trade. If a further decline in domestic prices can be averted, and the export trade is favored by the lifting of the world-wide depression caused by the shrinkage in the value of commodities, he is confident of another prosperous year.

The retiring directors (Sir Philip A. M. Nash, K.C.M.G., C.B., vice-chairman, and W. J. Firth) were re-elected at the conclusion of the meeting.

Foreign Competition Affects South African Cement Industry

The South African cement industry is said to be suffering a severe setback as a result of the dumping of cement from European countries, chiefly Germany, Poland and Czechoslovakia. Already one factory at Port Elizabeth has ceased production. The South African government recently took action against dumping from Holland, but nothing has been done in regard to dumping from Germany and Czechoslovakia, and cement, especially from the latter country, is pouring into South Africa in huge quantities at a price with which local manufacturers can not compete.

The action taken against the Dutch exporters is held to be wholly insufficient to safeguard the South African producers in view of the dimensions of the shipments coming from Czechoslovakia and Germany. The hope is expressed that the government will take immediate action to prevent the closing of further South African cement factories. Authoritative estimates place the quantity of foreign cement arriving in the country through Mossel Bay, Port Elizabeth, and East London alone at from 15,000 to 20,000 bags per month. Large quantities are also entering via Durban.

Directory of Cement Plants in France

A directory of cement plants located in France and her colonial possessions is printed in the January (1931) issue of *Le Ciment* (20, Rue Turgot, Paris, France).

The list enumerates 78 plants manufacturing portland cement and 72 plants manufacturing natural cement. The list of portland cement plants includes four in Algeria, one in Morocco and one in Indo-China.

Use of White and Colored Cement on Increase in England

One of the most notable circumstances of 1930 in Great Britain in the cement industries was the growth of the manufacture of white portland cement, begun at the end of 1929. Imports, mostly from the United States, have now nearly doubled. For cheaper colored work, the buff and red rapid-hardening cement is in increasing demand.

Prolong Life of Mill Equipment by Hard-Surfacing Wearing Parts

Red-Hard Alloys Applied by Oxy-Acetylene Process—Procedure for Hard-Facing—Cooling the Treated Pieces—Removing Blow Holes and Cracks

IN the manufacture of cement there are certain conditions so destructive to machinery that it has come to be accepted as inevitable that a certain piece of equipment will last but a given time and then require replacement. High temperatures combined with the severe abrasive action of rock and clinker or deposits of cement soon wear out even hardened steel parts.

Within the last few years, however, the use of hard-surfacing alloys applied by the oxy-acetylene process to wearing surfaces has multiplied the life of these parts many times. Cement mills have always found the oxy-acetylene process an indispensable ally in maintenance and repair work, and that is particularly true in regard to surfacing wearing parts with abrasion-resisting materials by this process.

Composition of Alloys

The principal constituents of a non-ferrous alloy of this class are cobalt, chromium and tungsten. This alloy, which is available in the form of welding rods, possesses the unique quality of "red-hardness." This "red-hardness" enables it to resist abrasion because it is not softened by the high surface temperatures generated by friction or by heat transmitted to the working parts by the products in the process of manufacture. Thus a thin coating of this material insures against or minimizes wear.

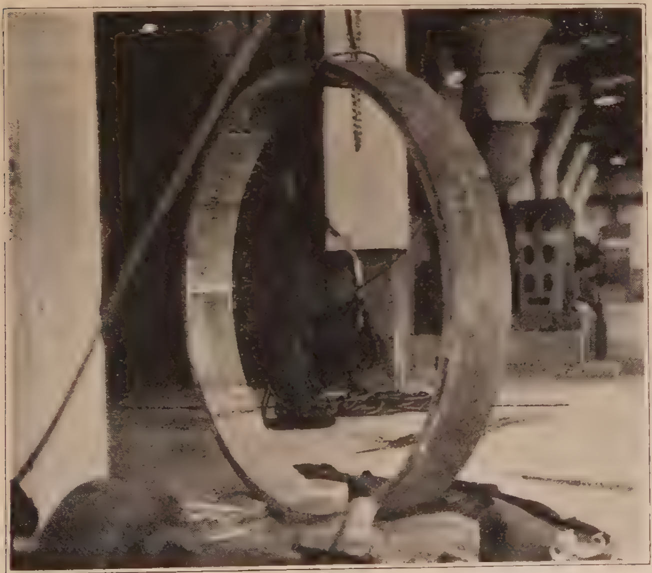


Fig. 1. Hard-faced grinder ring

The accompanying illustrations show typical parts of cement-making equipment surfaced with these abrasion-resisting alloys. It is now standard practice on these parts to have the wearing surfaces hard-faced.

Figure 1 shows a treated ring used for grinding cement clinker. A ring of this kind has been in service for 6,364 hours grinding 149,454 tons of clinker before being replaced, and even then only the edges of the ring needed building up, as the rest of the surface was in good condition.

The pulverizing of cement clinker consists of crushing it between the ring and three revolving rolls. Preceding each of these rolls is a plow which stirs up the material preparatory to the pulverizing. Figure 2 shows on the right a chilled iron plow after 48 hours' service and on the left a new hard-faced plow. The latter plow should remain in service for more than two weeks before showing any appreciable signs of wear.

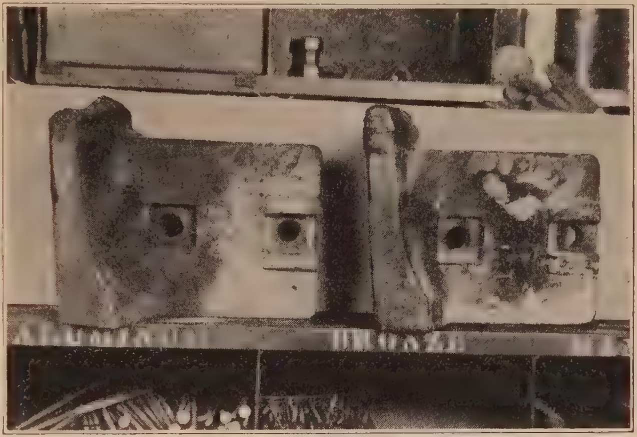


Fig. 2. Worn pulverizer plows (left) are built up (right)

The screw conveyor shown in Figure 3 is used for conveying crushed, ground or pulverized material. The illustration shows where it has been coated. An important feature is that the efficiency of the conveyor decreases rapidly as the periphery wears down. With abrasion-

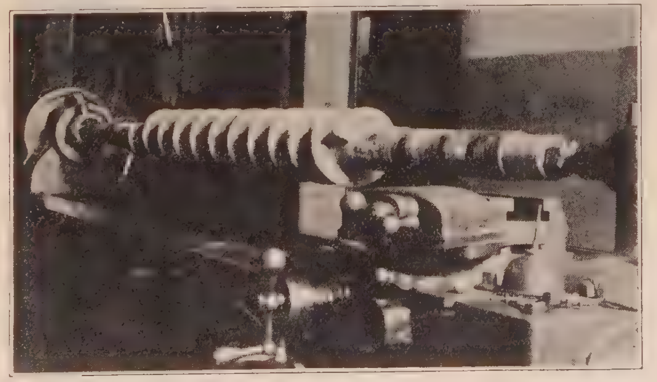


Fig. 3. Edges and surfaces hard-faced

resisting surfaces this wear, though not entirely prevented, is considerably delayed.

Figure 4 shows a new hard-faced gudgeon. The coated part of the gudgeon operates as a journal in a bearing. It is almost impossible to lubricate this as the hot cement works itself around the journal. The rate of wear is greatly reduced if the gudgeon is coated with a deposit of a special hard-facing material.

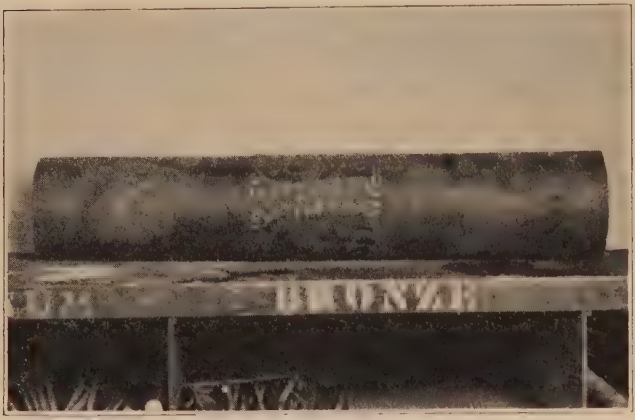


Fig. 4. Gudgeon for screw conveyor reinforced against wear

The drag chain operating under the kiln to draw off the red hot clinkers is supported by a series of shafts, one of which is shown in Figure 5. The abrasion of the drag chain is continuous. If any parts connected with this fail a shutdown of the whole kiln is necessary, due to the intense heat of the pit. This same heat, which makes lubrication impossible, plus the cement that accumulates under the shaft journals, causes these to wear out rapidly. The shutdowns of the kiln for replacement of shafting have been greatly reduced by treating the bearing ends of the shafts.

Applications of hard-facing around cement mills are numerous. The ones here described will give an idea of the possibilities for economy to be found in the proper application of this metal.

Fig. 5. Hard-surfacing increases life of drag chain shaft

Procedure for Hard-Facing by the Oxy-Acetylene Process

This process can be successfully applied to nearly all kinds of steel, and to cast and malleable iron. To obtain a homogeneous coating of the alloy free from blow holes, checks or cracks there are certain points which must be strictly observed.

No sharp corners must be left on the surface to be coated, which must also be clean and free from scale and rust. Cleaning can best be done either by grinding or machining. If the part is so constructed that this is difficult it may be cleaned with a file or wire brush. This latter method, however, may leave scale which must be floated during the tinning process.

It is desirable, if possible, to preheat the part to be coated. This, together with proper provision for slow cooling, will prevent the development of surface cracks. The preheating may be done with the oxy-acetylene flame, or if the parts are large and bulky, in a stationary or temporary furnace. If preheated with a blowpipe a neutral flame should be used until the piece approaches the proper temperature.

Where a permanent preheating furnace is used and the piece is removed from the furnace during the surfacing operation it should be covered with asbestos paper to protect it from uneven cooling.

In a temporary furnace where the piece will remain during the coating operation, all openings except those where the piece is exposed for work should be covered with asbestos paper or other insulating material so that an even temperature is maintained during the operation.

Use Reducing Flame

In applying the alloy with the oxy-acetylene process a reducing flame (excess of acetylene) is always used. This is necessary to prevent oxidizing the alloy. A neutral flame or one having a slight excess of oxygen will destroy some of the desired qualities of the material.

It is recommended that the feathery cone indicating excess acetylene should extend about double the length of the inner cone. Foaming and bubbling of the molten metal indicates an insufficient supply of acetylene. The presence of a heavy black carbon deposit indicates too great an excess.

The blowpipe should not be pointed directly at the surface being treated, for this will form craters and the base metal will alloy with the facing material, which must be prevented. The correct position of the blowpipe is shown in Figure 6.

Surfacing Steel or Cast Iron

If the base metal is steel do not actually melt it, but bring a small area at a time to a sweating point, then bring the end of the surfacing rod into the flame and melt it on to the sweating surface of the steel. If the steel is at the sweating point and the flame properly adjusted the molten metal will flow and spread like solder on a tinned surface. If the material is forced to spread by being poked with the welding rod the junction will not be as strong as if the metal is allowed to flow by itself.

If the base metal is cast iron it will not sweat like steel, and a little less acetylene should be used. The alloy does not flow as readily on cast iron as on steel, and since the melting point of cast iron is very close to that of the facing metal, care must be taken not to melt the cast iron but merely to get it hot enough so that the surfacing material will flow. Do not try to break the surface by poking it with the rod, for this will cause the cast iron to alloy with the hard coating.

Cooling the Treated Pieces

The hard-facing process is not complete until the pieces treated are cooled. It is recommended that the pieces, if large, be brought up to an even heat and then cooled evenly and slowly in a cooling bin or furnace.

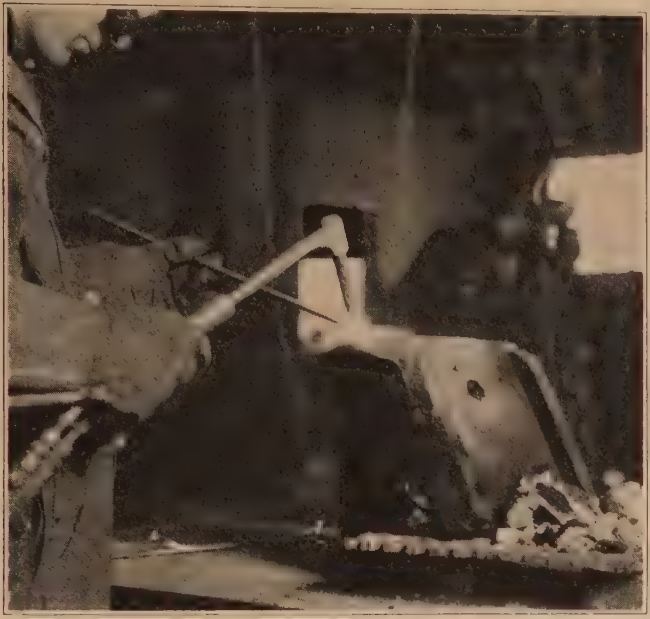


Fig. 6. Correct position of blowpipe during hard facing operation

Removing Blow Holes and Cracks

If, upon grinding, blow holes or cracks appear on the hard surface they can be eliminated, if necessary. The first step in this procedure is that of bringing the pieces up to the proper preheating temperature. Where blow holes exist melt the coating around the hole until the scale or impurity causing it is floated to the surface. Where checks or cracks are in evidence melt down the surface until the white line which shows up under the flame of the blowpipe has been eliminated, then build up to the required size.

Fig. 7. Welding work in machine shop of Olympic Portland Cement Co., Bellingham, Wash.

It is usually possible and desirable to build up the coating of abrasion-resisting alloy to the required thickness in one operation; but when a heavy coating is necessary it is a simple matter to add a second layer to the first.

Uninterrupted production in the cement industry is inseparably linked with maintenance of equipment. It can only be assured by eliminating shutdowns for repairs or replacement of equipment. The combination of hard-facing and the oxy-acetylene process is a real help toward uninterrupted production.

Illinois and Wisconsin Award Contracts for 6,000,000 Barrels of Highway Cement

The state highway departments of Illinois and Wisconsin on April 6 awarded contracts for cement aggregating more than 6,000,000 barrels.

Illinois contracts awarded totaled 5,000,000 barrels and Wisconsin bought 1,370,856 barrels.

The tabulation of the awards for Illinois is as follows: Marquette, 1,500,000 barrels; Universal Atlas, 900,000 barrels; International, 650,000 barrels; Lehigh, 500,000 barrels; Medusa, 500,000 barrels; Alpha, 400,000 barrels; Dewey, 275,000 barrels, and the Missouri, 275,000 barrels.

The companies sharing in the Wisconsin awards are: Lehigh, 612,233 barrels; Manitowoc, 528,833 barrels; Petoskey, 134,783 barrels, and the Marquette, 95,007 barrels.

P. C. A. Holds Annual Spring Meeting in New York

The annual spring meeting of the Portland Cement Association is to be held at the Biltmore Hotel, in New York, on May 11, 12 and 13.

During this meeting the Association safety trophy is to be awarded formally to the 43 mills listed on page 94 of the March issue of the Cement Mill Section of CONCRETE as having won the trophy by virtue of having completed the year of 1930 with no lost-time or fatal accidents. Eighty-six delegates—two from each winning mill—will be present to receive the award in behalf of the mills.

Among the winning mills the Lehigh plant at Iola, Kans., holds first place with 1,574 consecutive days without accidents, prior to January 1, 1931. The Alpha plant at Ironton, Ohio, holds second place with 1,484 days, and the Medusa plant at Toledo is third with 1,001 days.

Polish Cement Mill Declares Dividend

The Firley portland cement mills at Warsaw, Poland, report net profits of 2,417,555 zlotys and have declared a dividend of 6 per cent.

Temperature of Boiler Tubes

Joints Needed in Boiler Baffles to Permit Tubes to Expand and Contract—Trouble Not Due to Temperature of Tubes

By W. F. SCHAPHORST, M.E.

I have before me a printed publication in which this statement is made concerning boiler tubes passing through baffle walls: "Every tube is gas-tight, under temperatures up to 3,300 degrees F."

Having read similar erroneous statements before, and believing that the authors did not make them wilfully, I dare say that corrective comments on the subject will be welcomed by the authors as well as by readers. In other words, I am going to try to "straighten things out."

Boiler tubes passing through boiler baffles are always comparatively cool. They are never as hot as 3,000 degrees F., nor 2,000 degrees, nor even 1,500 degrees. I have before me a steam table published by a manufacturer of superheaters which shows that even where the steam pressure is 3,300 pounds per square inch the temperature of the steam is only 705 degrees F., and under no circumstances do they advocate superheat of more than 300 degrees, making the maximum possible steam temperature about 1,000 degrees F. At the same time it must be remembered that superheaters are seldom baffled. Superheaters are seldom "touched" by the baffle walls. The baffle walls make contact with tubes that are always cooler than 1,000 degrees F. In fact, as already stated, the water in the hottest tubes will never have a higher temperature than 705 degrees F. That is why I call the tubes "cool" as compared with the temperature in the furnace. Certainly these comparatively cool tubes will never permit the temperature of the baffle to reach 3,300 degrees F.

In actual practice it has been found that boiler baffles do not give trouble due to high temperature. They do give trouble due to the expansion and contraction of tubes, the valuable hot gases through the cracks, permitting these which action causes cracking and consequent leakage of gases to short-circuit into the stack.

It has also been found that it pays to provide expansion joints in boiler baffle walls for the same reason that expansion joints are provided in sidewalks, in railroads, in steel bridges and in pipe lines. Expansion joints permit the tubes to expand and contract without causing cracking and breaking of the baffle walls and without resultant heat and fuel loss.

New Developments in Explosives and Blasting Supplies

In a review of the explosives field for the year 1930, E. I. du Pont de Nemours & Company points out the important developments which have taken place.

To meet the conditions in quarry operations in certain sections of the country where well-drill holes of not more than 50 feet in depth are used, free-running quarry powders have been formulated which eliminate the necessity of cartridging and permit pouring the explosive directly from bags into the hole. A series of these quarry powders has been put out, all of which are very free-running. Improvement has also been made in the free-running powders already in use in other operations.

The low density permissibles have continued to be popular. The minute care exercised in the preparation of these has been rewarded by an enviable record on sensitiveness and uniformity of cartridge count during the year. To take care of wet conditions, powders of the semi-gelatinous type have been developed which are water-resistant. In cartridges per 50 pounds, these powders are intermediate between the permissible gelatins and the low density permissibles.

The favorable reception of low density ammonia powders during the past few years has led to still further expansion of dynamites of this type in order to meet the varied uses to which explosives are put in this country.

Blasting gelatin can now be obtained on the low freezing basis, thus making its use much safer and more convenient.

In the construction of roads through muskeg swamps the removal of the muskeg in order to insure the settling of the fill has been a great problem. A few years ago a method was developed of putting the fill on the surface, then shooting out the muck from underneath, permitting the entire fill to drop into place on a solid footing. State engineers have actively experimented with this method of shooting and in the past year it has been used with marked success in several states, particularly New Jersey.

In the field of blasting supplies, a new type of electric blasting cap put out in 1929 has been perfected.

The powerful new 100-hole blasting machine developed in 1929 has been subjected to unusual service, has performed admirably and on numerous occasions has fired well over its rated number of caps. The same type of improvement has now been made in the 30-hole and 10-hole machines.

French Bauxite Industry Hit by Industrial Depression

The general business depression is making itself felt in the bauxite producing center of France, which is located in Provence, not far from the Mediterranean Coast, with headquarters at Brignolles. Approximately 650,000 tons of bauxite are produced annually in France of which 500,000 tons come from the Provence section. The importance of this industry to France is quite evident when one takes into consideration that only 2,000,000 tons of bauxite are produced throughout the entire world.

During the past year there has been a serious drop in the amount of bauxite shipped out of Provence and several producers have laid off all of their employes while others have reduced their staffs or cut working hours. While slackness in the aluminous cement and fireproof brick industries is partly to blame for the slump, the principal blame falls on the slowing up in the aluminum and metal industries which normally absorb 75 per cent of the bauxite production.

Belgian Cement Firm Has Profitable Year

The annual report of the Ciments Portland Liegeois shows net profits of 3,492,322 francs. A sum of 1,873,156 francs has been added to the reserves and dividends of 15 francs on Class A and 1.05 francs on Class B stock declared.

The annual report of the Ciments Meuse-Brabant, Brussels, shows a net profit of 1,074,654 francs. Dividends have been reduced from 33.15 francs per to 20 francs net.

State and Municipal Cement Plants Show Losses and Failure

Accounting Methods Omit Items Properly Chargeable Against Plant—The Record in Michigan, South Dakota and Los Angeles—Question Being Agitated in Several States

AGITATION over state-owned cement plants, either existing or proposed, is in evidence in a considerable number of state legislatures this year—probably an unusually large number. In comparatively few of the states in which publicly-owned cement plants are proposed has the agitation attained serious proportions.

Quite naturally, this agitation is due in no small measure to the present economic situation. It is probable that in most of the states where new publicly-owned cement plants are being urged the agitation will quiet down to a mere simmering, or perhaps cool off completely, with the adjournment of legislatures.

On the other hand, it is not to be denied that legislative sentiment in a few states has been worked up to a pitch that may result in appropriations for the construction of state-owned plants.

Following is approximately the current situation in states where state-owned cement plants are either in existence or being advocated.

In Michigan

This state has had a plant in operation at Chelsea, Mich., since 1923. The plant was operated under lease for five years, and was bought outright by the state in 1928 for $625,000. Improvements and additions brought the capital outlay to $766,000. Prison labor was employed.

The taxpayers of Michigan have at last come to a realization that the cement plant has been a losing venture, in spite of claims to the contrary by state officials. The old practice of omitting charges that should be placed against the plant has been employed to make a good showing on paper. Now former Governor Green is quoted in a Detroit newspaper as saying that while the cost of the plant was to have been paid out of profits, there has been nothing but an annual deficit since.

The awakening of Michigan's taxpayers came to pass because the newspapers of the state, about the time the legislature convened, began publishing the facts concerning the cement plant. As a result, a strong sentiment has developed in favor of selling the plant for what it will bring, or scrapping it. A bill introduced in the legislature stipulates that the plant shall discontinue operations at once, and if a buyer cannot be found the plant is eventually to be scrapped. This, it is now believed, will be the ultimate end of the Chelsea plant, whether this bill is passed or not.

In South Dakota

The state-owned cement plant is located in Rapid City, S. D. Prison labor is employed. Construction of the plant was started in 1923 under a bond issue of $2,000,000 and the plant was in partial production in 1924. In 1925 an additional sum of $275,000 was appropriated to put the plant into full operation. An earlier appropriation of $25,000 had been made to cover the cement commission's exploration expenses.

Considering the period from 1925 to 1930, inclusive, the state auditor has each year reported a substantial profit. Only recently the plant superintendent announced that 1930 had been the most successful year of the period. The state auditor's reports show a cumulative profit of $668,684.40 for the 5½-year period ending with June 30, 1930.

In the meantime, however, William R. Coyle, member of Congress from Bethlehem, Pa., has been collecting data on state-owned cement plants. He has given special attention to their accounting methods, with the assistance of several experienced accountants, and he has given publicity to his findings in the form of a Congressional address delivered on February 18, 1931. He lists the following deficiencies in the accounting methods applied to the Rapid City plant:

(a) The rate of depreciation is less than the United States Treasury has established as the proper rate for the cement industry. The difference on this item alone, for the 5½-year period, is $121,000.

(b) Interest on the bonds through the sale of which the plant was built is not included in the auditor's annual statements of profit. This item amounts to $564,850 for the 5½-year period—a rather formidable item to pass off so lightly.

(c) Taxes which the state would collect if this cement plant were privately owned and operated are properly chargeable against the plant. This item is estimated at about $212,000 for the 5½-year period.

(d) In addition to the item of bond interest in (b), the state paid $182,400 interest on the bonds prior to the 5½-year period—that is, from the date of issue to December 31, 1924.

With items (a), (b), (c) and (d) taken into account, Mr. Coyle finds that the taxpayers of South Dakota have suffered an accumulated loss of about $411,000 up to June 30, 1930, instead of the supposed profit of $668,000.

In Los Angeles

In the congressional address of William R. Coyle, previously mentioned in connection with the South Dakota state-owned cement plant, he discusses the municipally-owned cement plant built by the City of Los Angeles at a cost of $890,000. The plant started operations in 1909, for the purpose of supplying cement on municipal construction work. After some years of operation the plant was sold for $450,000, and, in the meantime, the cement used cost the city an average of $1.31 per barrel more than the price at which it could have been bought from private manufacturers.

In Wisconsin

The agitation in favor of a state-owned cement plant in Wisconsin resulted in the introduction of a measure known as the Rubin bill, which would authorize the creation of a committee to report on the feasibility of establishing such a plant. The joint finance committee of the two branches of the legislature has recommended indefinite postponement of the bill.

If the recommendation is adopted the measure will be dead so far as this legislative session is concerned; but a similar bill was introduced two years ago, and future legislative sessions will probably bring forth others.

In Oklahoma

In the legislature of this state the house has passed a bill which, if finally enacted, would provide for the construction of a state-owned cement plant to be operated by prison labor. The bill provides for the appropriation of $300,000 out of state highway funds and $200,000 from other sources, for construction of the plant.

In Texas

Representative J. L. Goodman, of Franklin, has introduced a bill in the Texas legislature which would, if passed, appropriate $500,000 for the construction of a cement plant, to be operated under the direction of the state prison commission and by the employment of prison labor. A provision in the measure would require the state highway department to enter into contracts with the state-owned plant for all cement used in highway construction.

New Cement Firm Formed in Southwestern France

A new cement producing firm, Chaux et Ciments d'Yzaourt, has been incorporated at Yzaourt, in the southwestern part of France, with a capital of 1,200,000 francs.

Lehigh Common Stock Earns $1.56

The Lehigh Portland Cement Company for the twelve months ended March 31 reports a net income of $2,140,304, equal after 7 per cent preferred dividends to $1.56 on common. In the preceding year the company reported for the twelve months ended February 28, showing a net of $2,441,042, or $2.13 a common share.

"Old Machinery in the Shop Shows Obsolescence at the Top"

(From radio address over National Broadcasting Company Chain, April 26, 1931)

By **CARL A. JOHNSON**

President, National Machine Tool Builders' Association

THERE is a way by which American industry could start a series of buying movements with profit to itself, thereby giving employment to hundreds of thousands of men now out of work and taking effective steps toward the breaking of the "vicious circle" of delayed purchases.

Replace with modern, improved machinery the obsolete, out-of-date machinery now being used for production.

A machine becomes out-of-date just as soon as another machine is developed that will do more or better work.

You would not buy for your own use a radio, automobile, or tire made ten, or even five, years ago at the original price even if it were perfectly new, because you know you can get very much better service from up-to-date models.

How much more important is it for you as an employee, a stockholder, an officer, or a creditor of a company using machinery that your company's plant equipment be of the most modern character.

It costs more to use an obsolete machine than it costs to buy a new one. Hence, the user of obsolete machinery pays for the new machine in waste, but neither he, nor his workers, nor his stockholders get the benefit.

It has been conclusively shown, many times over, that time-saving machinery raises wages, creates more jobs, and makes available a greater choice of jobs for this and for each succeeding generation of workers. We have, in fact, attained our present standards of living only by the thoroughly American process of constantly improving our machinery, and we can maintain and improve these standards only by rigidly adhering to this policy.

It has been the practice in most industries for the works manager to ask his management for new machines and be compelled to argue for them. The roles should be reversed. Pressure for the replacement of out-of-date machinery should come from the management down and not from the works up.

At least once a year, management should procure a list of machines in use classified by age. Then the works manager should be compelled to prove that any machine over ten years old can still be profitably used. This simple procedure would disclose some startling leakages of money in almost every plant.

A management keeping obsolete machinery too long in service will in time find itself at the mercy of an up-to-date competitor. Hence, stockholders are also deeply interested in this same subject.

This little jingle I heard recently is truly a constructive slogan for all American industry:

"Old machinery in the shop
Shows obsolescence at the top."

Safety in the Plant Affects Safety in the Home

Accidents in Home Distract Mind of Worker—Many Sources of Danger

By J. R. CLINE
Universal Atlas Cement Company, Universal, Pa.

To begin with, "Of what interest is it to us at the plant that there is any safety in the home?" At the plants of our company it is of the greatest interest, for aside from all humanitarian interest we know that any accident at home affects conditions in our plants. If an employe is injured at home it means an experienced man has to be replaced by one usually not so good, while he is recovering; or if a member of the family of one of our employes is injured at home we know the employe is distracted from his work thinking about conditions at home; and this extends to all employes working near one who has had an accident at home because they express their natural sympathy to their fellow workman. It is therefore up to us to make the safety influence in our plant effective also in the home.

To prove that good results are being obtained, the word of the local plant doctor is most convincing. His statement is, "Outside the baby crop in our mill town, there is very little practice to make a doctor necessary except among people of the community not connected with the cement mill. Among families of employes there are very few accidents, and even sickness in this group is at a minimum, as the entire family seem to profit by the health suggestions given along with the safety work."

Safety properly taught to any man in the plant is bound to be transmitted to his family and they benefit by it. Working on shaky ladders is just as dangerous in the home as in the plant. The same applies to boards with nails sticking up, boxes or barrels with nails protruding inside to catch arms reaching into them. Material left on walks, rakes with prongs sticking up, stairways with buckets placed on stairs—all cause the same kind of an accident, whether in the plant or in the home. Broken bottles also left laying around cause very ugly wounds and run up the expense of auto tires.

Home and Plant Associated

At our safety meetings we consider the best means of impressing a great number of causes of accidents by referring to conditions that exist about the homes, so that the employee will be impressed doubly, once by the hazard in the mill and again by the association of ideas when he sees the object referred to in his own home.

Ladders without safety shoes or poorly constructed ladders are a very great hazard. When this hazard is explained it doesn't take a workman long to realize that a few dollars spent for a safe step ladder is much cheaper than paying doctor bills for injuries caused by falling from chairs, tables, boxes or other improvised ladders in the home, let alone the suffering caused to the member of his family by the injury.

Unguarded gears are dangerous, such as bicycle sprockets, gears in the drive to washing machines, automobile gears exposed while doing repairs, and the somewhat similar constant source of danger in the wringer on the washing machine. When a hand gets caught in a wringer, there is, of course, a safety release, but women and children get excited almost as much as some men in the mills when an accident occurs; the arm is drawn in nearly to the elbow and the rolls grind the flesh off; or the thumb catches on the side or top roll and splits the hand between the thumb and the first finger. All these accidents have occurred and their repetition is being prevented by using them as examples in explaining the mill hazards.

At our plant we have given every man the Bureau of Mines training and we encourage the men to practice at home.

How do physical examinations in the plant help at home? When a man is told that his eyes are bad or he has any one of a number of ailments that should be taken care of, he is checked up in a couple of weeks or a month by our labor man, who talks to him and asks him about it. This man in turn helps to check the health of members of his family.

Appropriate Monthly Appeal

I usually talk to our fellows each month, and each time with a little different approach. In January we start out with New Year's No-accident-month. In February there is Valentine's Day; in March St. Patrick's No-accident-month; in May it is too pretty to have an accident; in June it is something else; and so on. When we reach November there is Thanksgiving No-accident-month and the little couplet that can be used, "No pumpkin pies for reckless guys." All that helps the men to remember safety. Then, at Christmas-time we mention the hazard of celluloid toys.

If you have an injury in your plant, when that fellow gets back on the job say to him, "Do you know what that accident cost the company?" Perhaps it is one hundred and fifty or three hundred dollars, and might look trivial on the face of it. But then you can go on and say, "Now, if your boy broke his leg because a scrub bucket was set at the top of the stairs, what would it cost you? Just about as much as your accident cost the company. Can you afford to pay such bills?"

Abstracted from paper presented before the Cement Section of the National Safety Council, at the Nineteenth Annual Safety Congress, Pittsburgh, Pa., Sept. 29 to Oct. 3, 1930.

Lehigh Wrecks Old Mill Buildings at Mitchell, Indiana

Wrecking of the group of old mill buildings near the present Lehigh Portland Cement Company plant at Mitchell, Indiana, was begun late in March.

Largest Cottrell Precipitator to Be Described in June Issue

The largest Cottrell precipitator, for the collection of dust by the electrical precipitation method, is now being installed in a cement plant. The installation utilizes the most modern developments in the removal of suspended particles from gases by the electrical process.

This installation will be described and illustrated in detail in the June issue of the Cement Mill Section of "Concrete."

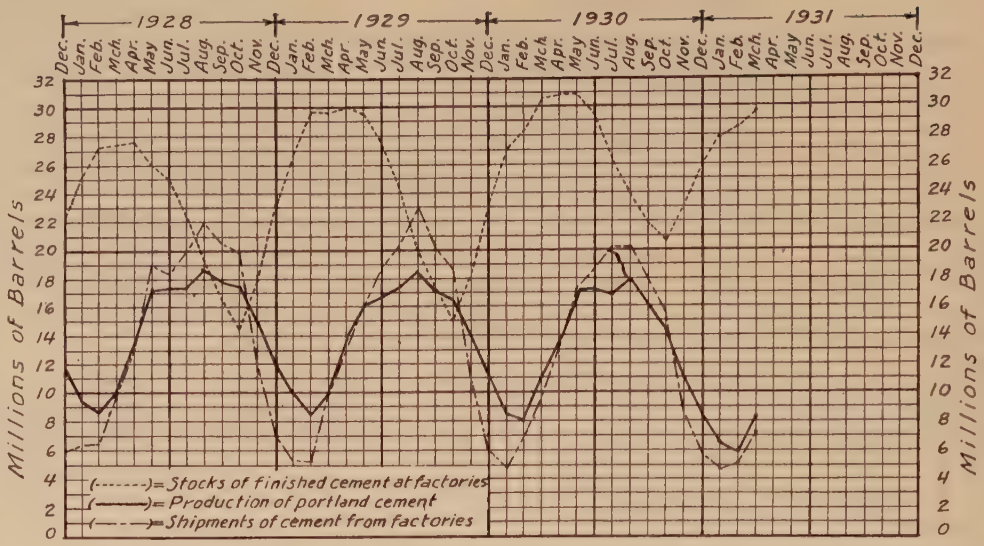
Cement Statistics for March

March, 1930, Figures Continue to Exceed Those of Current Year—Bureau of Mines Report Shows Production of 8,227,000 Barrels

Relation of Production to Capacity

(Figures represent per cent)

	The Month	The Twelve Months
March, 1931	36.9	58.6
March, 1930	**51.5**	**66.1**
February, 1931	29.4	59.7
January, 1931	29.5	60.6
December, 1930	38.2	61.5



	1930	1931	Increase or Decrease, %
Production, March	**11,225,000**	8,227,000	—26.7
Shipments, March	**8,826,000**	7,172,000	—18.7
Stocks at end of month	**30,648,000**	29,627,000	—3.3

	1930	1931	Increase or Decrease, %
Total production for year	**27,885,000**	20,642,000	—35
Total shipments for year	**20,793,000**	16,938,000	—22.9
No. of plants reporting	165	165	......

Production, Shipments, and Stocks of Finished Portland Cement, by Districts, in March, 1930 and 1931, and Stocks in February, 1931

District	Production—March		Shipments—March		Stocks at end of month		Stocks at end of February, 1931*
	1930	1931	1930	1931	1930	1931	
Eastern Pa., N. J., and Md.	**2,717,000**	2,293,000	**2,311,000**	1,724,000	**7,095,000**	6,622,000	6,054,000
New York and Maine	**618,000**	437,000	**472,000**	381,000	1,702,000	**2,013,000**	1,957,000
Ohio, Western Pa., and W. Va.	**1,205,000**	444,000	**724,000**	595,000	**3,882,000**	3,554,000	3,705,000
Michigan	**383,000**	73,000	**411,000**	286,000	**2,734,000**	2,600,000	2,814,000
Wis., Ill., Ind., and Ky.	**1,129,000**	797,000	**696,000**	526,000	**4,578,000**	4,237,000	3,966,000
Va., Tenn., Ala., Ga., Fla., and La.	**1,099,000**	923,000	970,000	**1,041,000**	**1,728,000**	1,676,000	1,794,000
Eastern Mo., Ia., Minn., and S. Dak.	**971,000**	869,000	**502,000**	494,000	**3,864,000**	3,833,000	3,458,000
W. Mo., Nebr., Kans., Okla., and Ark.	**945,000**	638,000	**838,000**	520,000	1,941,000	**2,196,000**	2,077,000
Texas	**694,000**	489,000	**627,000**	456,000	**845,000**	773,000	740,000
Colo., Mont., Utah, Wyo., and Idaho	**240,000**	192,000	**163,000**	126,000	518,000	**552,000**	486,000
California	**873,000**	830,000	**816,000**	770,000	**1,187,000**	998,000	938,000
Oregon and Washington	**351,000**	242,000	**296,000**	253,000	**574,000**	573,000	583,000
	11,225,000	8,227,000	**8,826,000**	7,172,000	**30,648,000**	29,627,000	28,572,000

Production, Shipments, and Stocks of Finished Portland Cement, by Months, in 1930 and 1931

Month	—Production—		—Shipments—		Stocks at end of month	
	1930	1931	1930	1931	1930	1931
January	**8,498,000**	6,595,000	**4,955,000**	4,692,000	27,081,000	***27,759,000**
February	**8,162,000**	5,920,000	**7,012,000**	*5,074,000	28,249,000	***28,572,000**
March	**11,225,000**	8,227,000	**8,826,000**	7,172,000	**30,648,000**	29,627,000
April	13,521,000	....	13,340,000	....	30,867,000	....
May	17,249,000	....	17,224,000	....	30,891,000	....
June	17,239,000	....	18,781,000	....	29,364,000	....
July	17,078,000	....	20,153,000	....	26,289,000	....
August	17,821,000	....	20,299,000	....	23,824,000	....
September	16,124,000	....	18,083,000	....	21,889,000	....
October	14,410,000	....	15,599,000	....	20,697,000	....
November	11,098,000	....	8,784,000	....	23,056,000	....
December	8,480,000	....	5,688,000	....	25,883,000	....
	160,905,000	....	158,744,000	....	————	————

Blacker type indicates larger of two figures.

*Revised.

MEN and MILLS

Notes from the Field

"Snowquet" Cement Men's Sport in Duluth's Mildest Winter

The warmest winter at Duluth, Minnesota, since 1882, permitted a croquet game on the lawn of the Universal Atlas Cement Company's Duluth plant practically every day from Thanksgiving on, on a court that winter usually buries in two feet of snow, according to Ray S. Huey, superintendent.

Twice during the winter Mr. Huey and his rivals at this sport of "snowquet" missed their lunch-hour game on account of four-inch snowfalls, but once they continued at 15 below zero. "Playing in two inches of snow," he says, "is like playing in summer when the grass is high."

Other veterans of this wild northern winter of wickets are Martin Lindquist, mill foreman; A. E. Miller, packing and loading foreman; A. S. Hetherington, employment and safety director; Earl Staley and Hilbert Anderson, billing clerks; and Claude Lutzka, shipping clerk.

Complication of Ailments Proves Fatal to Samuel Kidd

Samuel A. Kidd, 49, chief clerk at the Lehigh Portland Cement Company plant at Oglesby, Illinois, and connected with the office for 24 years, passed away March 28. His death was ascribed to a complication of ailments.

He joined the company in 1907 and for many years held the position of chief clerk. He also served as president of the Oglesby board of education for a number of years and as the director of a local bank. Both the bank and Oglesby schools observed the day of the funeral by closing.

Arkansas Portland Cuts Length of Shifts in Half

The Arkansas Portland Cement Company of Okay, Arkansas, has recently changed its shifts from two of twelve hours each to three of eight hours each.

Coplay Stockholders Meet

Stockholders of the Coplay Cement Manufacturing Company met at the general office of the company at Coplay, Pa., on April 6. Alfred Meyer of Chicago was elected as a director to succeed his brother, Edwin F. Meyer, who had died early this year. With this exception, all former directors were re-elected.

Medusa and Newaygo Prepare Parks for Trophies

As a fitting location for its safety award for 1930, the Medusa Cement Company is having workmen create a park at the plant near La Salle, Illinois, on a tract of ground adjoining Blackhawk Trail, Illinois' longest highway. A similar project is being undertaken by the Newaygo Portland Cement Company near its plant at Newaygo, Michigan.

Both parks are to be furnished with flowers, shrubs, walks, fountains and concrete benches. The Medusa trophy will be floodlighted by night.

Hensley Leaves Arkansas Portland to Join Missouri

Frank K. Hensley, formerly chief chemist of the Arkansas Portland Cement Company, has accepted a similar position with the Missouri Portland Cement Company at St. Louis, effective May 1.

Flory and White Elected Medusa Company Directors

Walter L. Flory and W. L. White, Jr., were elected directors of the Medusa Portland Cement Company to succeed L. E. Geer and Frederic Pickford on April 9.

Cumberland Provides Gardens

During the recent shutdown period, the Cumberland Portland Cement Company at Cowan, Tennessee, provided large size gardens to those employes desirous of cultivating them.

Penn-Dixie Master Mechanic Is Transferred

J. Guida, master mechanic, has been transferred from the Penn-Dixie plant at Richard City, Tennessee, to the plant at Des Moines, Iowa.

Van Benthusen, Universal Atlas Employment Manager, Dies

Funeral services for James W. Van Benthusen, for 11 years employment manager of the Universal Atlas Cement Company, were held April 17 at Chicago. His death occurred April 16. In addition to his regular position, Mr. Van Benthusen also was a director in the Employes' Welfare Association of the cement company and interested in its group insurance plan and other activities.

Prior to joining the company, he was chief rate clerk for the Pere Marquette Railroad. He was active in community affairs. He was a native of Iowa and interment occurred at Marble Rock in that state.

Springer Appointed Penn-Dixie Contract Sales Manager

The Pennsylvania-Dixie Cement Corporation, New York City, has announced the advancement of H. B. Springer to the position of manager of contract sales with headquarters in New York.

Clark P. Brown succeeds him as district sales manager in charge of Penn-Dixie's Philadelphia sales office.

Mathews, Peerless Sales Manager, Dies

William J. Mathews, 50, city sales manager of the Peerless Portland Cement Company, died April 4 at Detroit, Michigan.

He joined the Egyptian Portland Cement Company about ten years ago, before its amalgamation with the Peerless company. While his business headquarters were in Detroit, Mr. Mathews' home was in Port Huron, Mich.

Frank H. Smith Appointed Campaign Manager

Frank H. Smith, president of the Lawrence Portland Cement Company and a resident of Plainfield, New Jersey, has accepted the position as campaign manager for David Baird, Jr., candidate for the Republican nomination for governor.

Smith is also head of the State Department of Banking and Insurance, a position he has held since 1917.

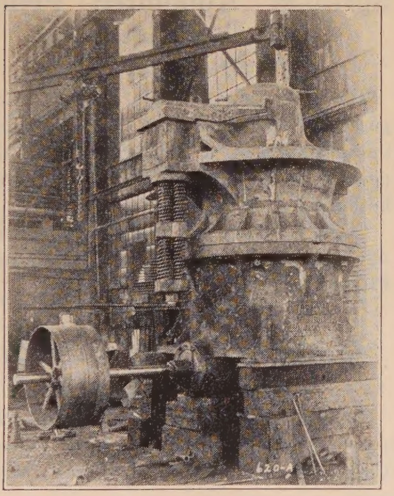
Mill Equipment

Heavy Proportions and Wide Crushing Range Features of New Traylor Crusher

Built of extra heavy proportions and in an unusually wide range of crushing sizes, a new reduction crusher has recently been placed on the market by the Traylor Engineering and Manufacturing Company, Allentown, Pa. Many of the features of the Traylor Bulldog gyratory crusher are incorporated in it.

The Type TZ, as it is known, is built in six sizes capable of hourly production ranging from about fifteen tons, ½ in. ring size, in the smallest machine, to nearly one thousand tons 2½ ring, in the largest size.

The crusher is of the gyratory type with a bell-shaped crushing head. The concaves are sharply convexed from top to bottom of the bowl, so as to eliminate choking.



At reasonable cost, it is stated, it may be applied to any existing gyratory crusher of any make, with or without the balance lever and tension springs. Installing the TZ type of head and concaves, it is pointed out, in an old gyratory and converting it into a reduction crusher increases the capacity at a smaller product size enormously.

The crusher is designed with a balance lever and tension springs to support the head and shaft, the spring being adjusted to a tension sufficient to withstand the downward thrust of the head due to crushing, and at the same time allow the head to be depressed considerably.

Most efficient operation is secured without the use of a feeder, according to the Traylor Company.

Pressure Gauge of Dead Weight Tester Type

Dead weight gauge tester accuracy and permanence of calibration, together with unlimited power for the operation of indicators, recorders and control devices, are said to be features of the new Bailey power type pressure device. This device is in effect a dead weight gauge tester combined with a hydraulic torque amplifier and a Selsyn motor system of long distance transmission.

The power type pressure device is located near the pressure to be indicated or recorded. This pressure is applied by means of the pressure connection at the bottom of the device to a small pressure piston which supports a pilot valve and a cup containing mercury. This portion of the pressure device which is continuously rotated to eliminate static friction is equivalent to a dead weight pressure gauge tester, as the applied pressure is counterbalanced by the weight of the rotating parts and mercury plus reaction of the displacer in the mercury. A small motor which rotates the pressure piston pilot valve and mercury cup is also used to drive a small oil pump which provides the oil pressure required for operation of the power piston, displacer and Selsyn motor.

When the applied pressure increases or decreases, the pressure piston rises or falls proportionately, and in so doing permits oil under pressure to pass through the pilot valve to the upper or lower side of the power piston. If the pressure is increasing the pressure piston, pilot valve and mercury cup move upward, thereby throwing the pilot valve out of its neutral position and applying oil pressure to the upper side of the power piston. This causes the power piston to move downward, forcing the displacer deeper into the mercury.

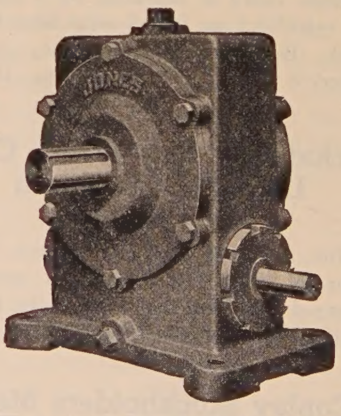
The reaction of the buoyant force of the mercury against the displacer will cause the mercury cup and pilot valve to be forced downward against the increased pressure under the pressure piston. This downward movement of the mercury cup, pilot valve and pressure piston returns the pilot valve to its neutral position and closes off the oil supply to the power piston. Consequently for each pressure applied to the small rotating pressure piston, a definite position of the power piston and displacer is obtained. By driving a Selsyn motor from the rack on the power piston rod, the position of the Selsyn is an accurate indication of the applied pressure. Since the receiving Selsyn indicators and recorders assume the same position as the transmitting Selsyn, it is possible to secure accurate remote indications or records of the desired pressure.

By varying the diameter of the pressure piston, the size of the mercury cup and the size of the displacer, it is not only possible to furnish this power pressure unit for practically any maximum pressure but also for a very large suppression. Since this type of indicator is 42 inches in diameter, each division which represents a pound covers considerable space on the indicating scale. Indicators of this type make ideal master pressure indicators for central station use. The possibility of connecting as many as 12 or more indicators or recorders in the same master pressure circuit, makes this device a desirable means for indicating and recording master steam pressure. The Selsyn motor system of transmission which is employed by this device, permits of the installation of master pressure indicators or recorders in the control room on the switchboard without fear of leaks from pressure lines as has been the case heretofore.

If desired, the mercury cup can be designed so that the maximum pressure can be varied within limits by the addition or removal of weights. In this case, the compression is changed but the magnified pressure range remains the same.

Worm Gear Reducers for Small Electric Motor Drives Developed

Almost identical with the heavy-duty Jones worm gear speed reducers, except in size, three new small worm gear speed reducers have been developed recently by the W. A. Jones Foundry & Machine Company, Chicago, Ill. The series is designed for small electric motor drives, up to seven horsepower capacity.



The worm is made from a low-carbon,

nickel steel forging that is hardened to increase strength and wearing qualities and to provide for a low coefficient of friction. The wheel is made of a special nickel phosphor bronze alloy. The gear blank is dry sand cast and chilled, producing a casting of exceptional strength and load carrying capacity with a minimum of friction. The teeth are generated to a very high degree of accuracy by specially designed hobs, it is stated. The gear shaft—a high carbon steel forging—extends out on both sides of the housing so that machines can be driven from right or left-hand side or both. A metal cap, or shaft guard, covers one shaft and is easily removed. Both the gear shaft and the worm shaft are mounted on Timken roller bearings.

Engineer Makes Suggestions for Increasing Belt Conveyor Life

Getting the most out of present plant equipment is a subject covered by W. E. Philips, engineer for the Link-Belt Company, Chicago, in an article, "How to Increase Belt Conveyor Life," recently made available.

His five simple suggestions are based on the assumption that when the conveyor was originally installed the idlers were lined up square with the belt; that an experienced engineer's advice was taken when determining on the belt design for the material to be handled; and that the belt was lined up correctly with the idlers.

The suggestions are as follows:

1. *Lubrication.* Sufficient greasing with the proper kind of grease, although infrequently needed.

2. *Cleanliness.* Keep the space under the belt clean. Clean the decking when material overflows and threatens to clog the idlers. Clogging increases the friction load, resulting in greater power consumption and wear on the driving mechanism as well as the idlers and belt.

3. *Loading.* Do not overload. Use an idler sufficiently heavy, and a belt designed for the service expected. Have material reach the belt in the same direction the belt is moving and with as little impact as possible. Use feeders when necessary as they create a steady flow of material without shock to the conveyor.

4. *Wear.* There are many reasons for uneven or premature wear on belts and idlers. Belts scraping against framework, skirtboards, or wedged material are the chief causes. Dragging idlers, caused by insufficient lubrication, or clogged rolls, cause undue wear on both the belt and idler, and put an extra load on the driving mechanism.

5. *Training the belt.* Train the belt while empty, then if it runs out of line when loaded it is because of unequal loading. Fix the loading chute or install a feeder. Adjustment cannot be made by taking up the take-ups on one side or the other. See that the belt contacts the center roll of the idler because this roll steers the belt. Foundations for the idler should be firm and secure. Side, or guide idlers, should not be used when training the belt. Do not increase belt tension as this will injure the belt without obtaining the desired results.

New Combination Multi-Speed Drive and Motor

A multi-speed reduction gear unit built in combination with a standard a.c. motor has been developed by Roy T. Wise, consulting engineer, Westinghouse Electric and Manufacturing Company. Constructed to give four different speeds to the output shaft at constant horsepower, this unit, known as the Westinghouse-Wise Multi-Speed Drive, is applicable to operations which, for highly efficient performance, require drives providing more than one speed. With this drive the speed of the driven apparatus may be changed instantly while the motor is running at full speed and under full load. All gears are constantly in mesh, and in no way can the operator injure the unit by changing speeds at anytime, according to the Westinghouse company.

This gear unit is mounted on a standard squirrel-cage Westinghouse induction motor. In the gear unit, a pinion mounted on the motor shaft drives a gear mounted on the countershaft. Also on the countershaft are four idling ring gears which are constantly in mesh with four gears that are pressed on the output shaft. Each of the countershaft gears is provided with an integral clutch which is made to fit the bore of the gear.

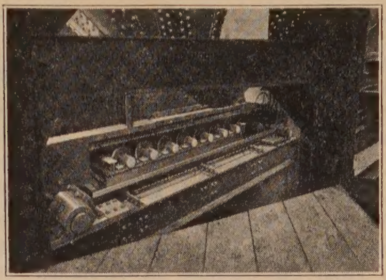
Between each speed is a neutral position. To disengage the clutch and bring it into a neutral position, it is only necessary to rotate the handle to draw the spring member into a position which does not contact the expanding wedges. A further movement of the handle brings the spring member into contact with the next set of expanding wedges, and clutches the next gear to the countershaft. Therefore, it is not only possible to make speed changes under full load, but the apparatus can be stopped or started under that condition.

Heavy-Duty Apron Feeder Announced by Link-Belt

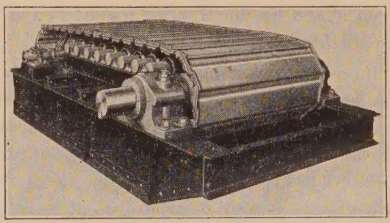
A new, distinctive design of heavy-duty manganese steel apron feeder has recently been completed by the Link-Belt Co.

The new feeder is suitable for handling either abrasive or non-abrasive material containing lumps of ¼-in. size, and smaller, up to 6-ft. dimensions, being especially well adapted to the handling of extremely heavy, large, lumpy and abrasive materials.

The sprockets, chains, rollers and overlapping "non-sagging" apron pans are made of cast manganese steel, and the pans, which are ribbed, are ⅜ to 1½ in. thick, depending upon the service.



The chains have no small rollers, and they are placed underneath the pans at locations which break up the span of the pans. They are protected from dirt, and the stiff-back arrangement requires only a minimum of space and width for the feeder.



Full details, data, and illustrations of this new apron feeder and its component parts, as well as installation views are shown in Folder No. 1251, which is being distributed by Link-Belt Company, Chicago, Illinois.

Two New Alloys for High Temperature, Hard Service Conditions

Two new alloys, one for high temperature and the other for hard service conditions, have been perfected by the Chicago Steel Foundry Company, Chicago. They are already in use as screw conveyors, clinker cooler plates, and in replacement parts.

Pyrasteel, the heat-resisting alloy, is made in different grades for varying services and temperatures, the latter ranging from as high as 2200 deg. Its use is suggested under conditions calling for resistance to corrosion, oxidation, abrasion, and for tensile strength at high temperatures.

Evansteel, a nickel-chrome alloy, is adapted for severe service and is available in three grades. It has high tensile strength and toughness, and is at the same time easily machined, it is stated.

About the Manufacturers of Equipment

Industrial Literature

Explosives Chart

A new bulletin published by *E. I. du Pont de Nemours & Company,* Wilmington, Delaware, entitled "Brands of du Pont Explosives and Uses to Which They Are Adapted" consists of a seventh edition of this charted information. It is issued for the purpose of aiding users of explosives to avoid the purchase of unsuitable explosives and to select those which will give the best results in proportion to cost. The chart has been revised to include new explosives added to the list of du Pont brands during the past year.

Pulley and Sheave Catalog

Catalog No. 24 of *The Lindahl Line* has been issued by the *Henry Lindahl Foundry & Machine Company,* Chicago.

It covers the complete line of machine molded pulleys, conveyor pulleys, ball bearing pulleys, and so forth, and sheaves of all kinds. Complete information and tables are given for the designing of V-belt drives, as well as price lists of sheaves and belts.

Kiln Bulletin

A new bulletin, *No.* 1457-*B,* issued by the *Allis-Chalmers Manufacturing Company,* Milwaukee, Wis., on rotary kilns, coolers and dryers, is a 32-page publication devoted entirely to cement plant installations.

Kiln capacities and power requirements and dryer capacities are tabulated.

Differential Pressure Control

"*Differential Pressure Control*" is a 16-page booklet just issued by the *Northern Equipment Company* for those concerned with efficient boiler operation.

Material presented in the booklet is designed to give a clearer understanding of differential pressure control as a means to increasing the operating efficiency of modern boilers.

Building Cost

"*What Should My Building Cost,*" is the title and subject of *Bulletin No.* 13 published lately by the Morton C. Tuttle Company, Boston, Mass. A hypothetical problem in structural design is presented, with three schemes carried through to show which is most economical.

Dead Weight Type Pressure Gauge

A pressure gauge which embodies dead weight tester accuracy and permanence of calibration together with abundant power for the operation of remote type indicators, recorders and control devices is described in a new bulletin entitled, "Power Type Pressure Devices," which is being distributed by the Bailey Meter Company of Cleveland, Ohio.

The new bulletin No. 70 describes and illustrates Bailey Power Type Pressure devices explaining how the dead weight tester principle is combined with a hydraulic torque amplifier and a Selsyn motor system of long distance transmission.

This power type unit in addition to serving as a pressure gauge may be used for the operation of switches or for the direct positioning of small valves, rheostats or other equipment in accordance with pressure. Its principle use, however, as explained in the bulletin, is for the operation of a master steam pressure indicating and recording system where it is desired to have a number of indicators or recorders located at various stations.

Notes From the Field

Greensfelder of Hercules Dies

Nelson S. Greensfelder, advertising manager of *Hercules Powder Company* and nationally known authority on industrial advertising, died at Wilmington, Del., Sunday morning, April 5.

The end came suddenly after a short illness which quickly developed into pneumonia.

Mr. Greensfelder was born in St. Louis county, Missouri, March 20, 1891. He attended Colorado College and later the Colorado School of Mines, graduating in 1913 as an Engineer of Mines. He entered the employ of Hercules Powder Company as a salesman and demonstrator and upon showing ability as a writer and advertiser was transferred to the home offices in Wilmington. He became advertising manager in 1924.

A number of his activities brought Greensfelder into national prominence. One of the organizers of the National Industrial Advertisers' Association, he became its president and represented the organization at the world advertising institute in Berlin, Germany, in 1929.

He was director of "The Explosive Engineer," published by the Hercules Powder Company, a magazine of international circulation sponsoring safer and getter methods of using explosives. Through "The Explosive Engineer" he was instrumental in instituting the National Safety Competition, annually awarding trophies to the winners of this competition. Under the U. S. Bureau of Mines, this safety movement has been responsible for wide reduction in industrial accidents.

Bailey Meter Exhibit

The Bailey Meter exhibit in Booths 246 and 247 at the Thirteenth Exposition of Chemical Industries, Grand Central Palace, New York City, the week of May 4, will consist of metering, control and regulating equipment.

Bailey boiler meters, fluid meters, Multi-Pointer gages and Selsyn Operated equipment will be shown mounted on meter panels. A Bailey remote type liquid level recorder will be in operation.

One of the outstanding features of this exhibit is a gravity recorder for making a continuous record of the gravity of a liquid as it flows through a pipe line or as it is sampled from a storage tank.

A complete line of regulating equipment for the control of feed water to boilers and also for level control in evaporators and other process vessels will be exhibited. This regulating equipment embodies the fully balanced tight closing regulating valve as used in the Bailey Thermo-Hydraulic Feed Water Regulator which has been widely accepted by power plant engineers.

The exhibit will be in charge of H. M. Hammond, manager of sales and engineering, and H. C. Wheaton, W. L. Paulison, H. Beaman, T. N. Graser, R. M. Cundiff, C. S. Burnett and R. F. Tinsley will be in attendance during the exposition.

Traylor New York Office

Beginning May 1st the New York office of the *Traylor Engineering and Manufacturing Company* is located in the Empire State building, Room 2513.

The office, in charge of R. R. Shafter, has been removed from 30 Church street.

Penn-Dixie Manager

The Pennsylvania-Dixie Cement Corporation, New York City, has announced the advancement of *H. B. Springer* to the position of manager of contract sales with headquarters in New York.

Clark P. Brown succeeds him as district sales manager in charge of the Philadelphia sales office.